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## A NEW STEAM CATAMARAN.

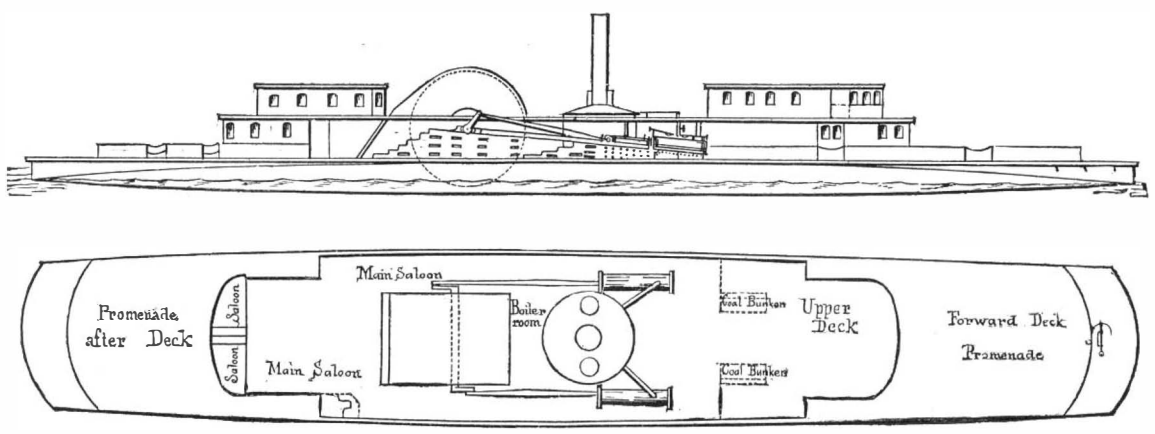
Not a few of those who have traveled on the steamers of the Hudson River for the past four seasons have had their curiosity excited by the appearance of a strange looking structure plying about the waters of the Tappan Zee, where the river widens out lake-like between Tarrytown and Nyack.

Two elongated cylinders projecting from beneath a long narrow house, a pilot house, and smokestack gave the monster a certain nautical air; but it was not until notices appeared in the papers describing it that the public became aware of the problem in marine architecture that Commodore W Voorhis was trying by patient work and great financial outlay to solve.

Occasionally the strange craft would glide out from her slip and run over the waters of the quiet bay with a speed and steadiness truly astonishing. Again she would move so slowly that a pleasure yacht might, as the natives expressed it, "make a dock of her;" but each time she appeared some new change could be noticed, until, from a propeller with hidden wheel and single funnel, she was metamorphosed into a double stacked, huge center wheeled boat. Other changes have also been made. The long projecting iron points had been decked over into broad promenades, the boiler and engines changed, the steering gear likewise hidden; in fact, little but the twin hulls remains as it was originally.

Four years having been consumed in these experiments, she at last steamed out for a decisive test early last month.

Turning her bows up river, the city of Poughkeepsie was reached in a surprisingly short time, when turning homeward she was laid beside one of the Albany day boats, and a contest ensued for twenty miles, resulting in a drawn battle, for neither could leave the other. The Henry W. Longfellow during the trial was making 20 revolutions per minute, but when her boilers ceased to foam her speed rapidly increased, until one of the buckets becoming loosened demolished the wheel house and necessitated her return for repairs. Her builder is pleased with her trial, and with 30 revolutions predicts for her a speed unsurpassed by any steamer now plying on our waters.



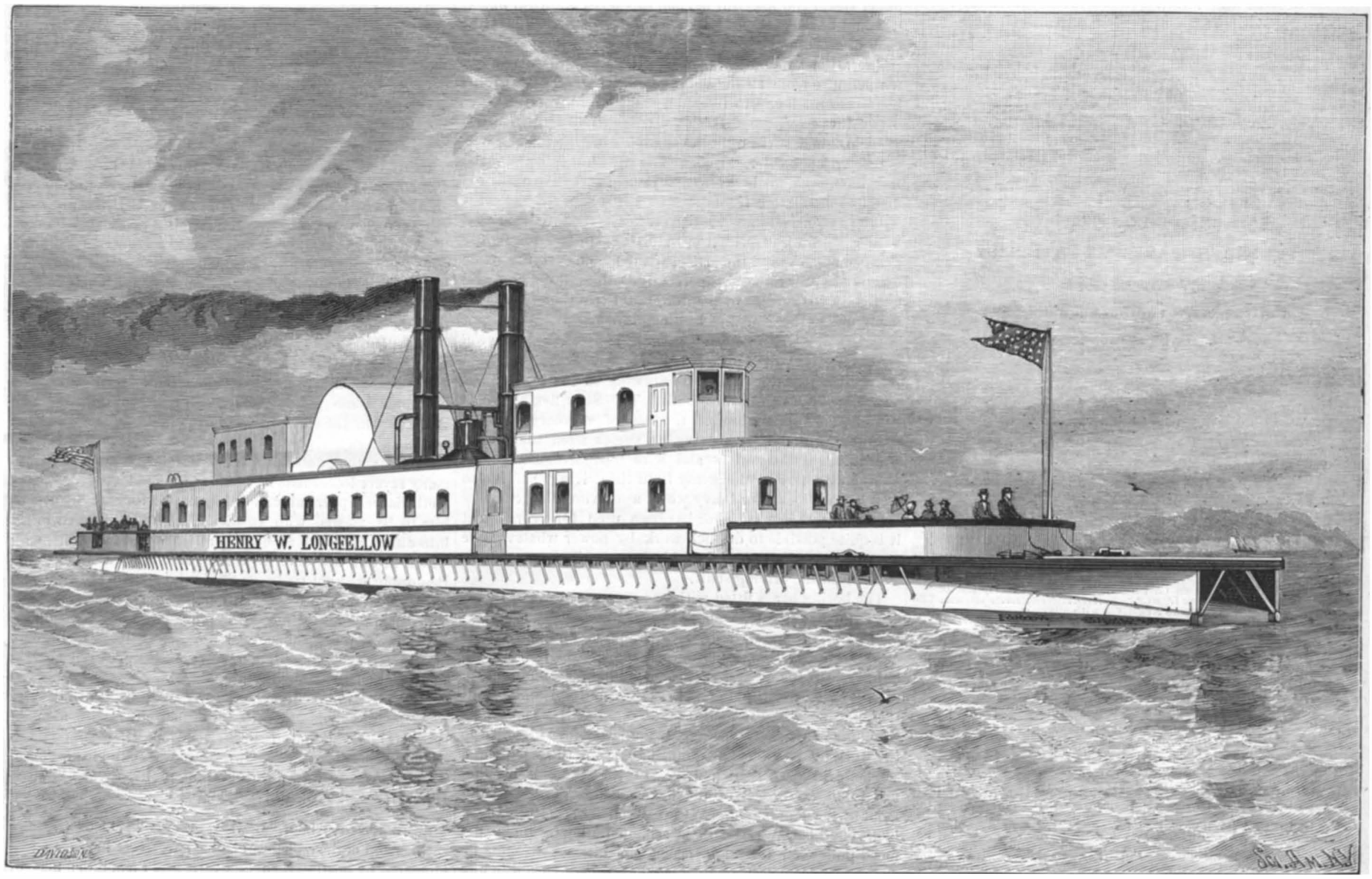

DIAGRAMS OF THE STEAM CATAMARAN.

The dimensions of the strange looking craft are as follows: Length over all, 190 feet; width on deck, 25 feet; width of bulls, 5 feet 6 inches; draught, loaded, 28 inches. There are five watertight bulkheads in each hull, and the entire interior of each is diagonally braced. Her engines are of the type used on Mississippi River steamers, and are made by James Rees, of Pittsburg, Pa. Her two cylinders are 13 inches diameter by 5 feet stroke. Wheel, 22 feet diameter, 8 feet face, 18 inch buckets. Revolutions to be made, 30. She has one high pressure Ward coil boiler, containing 2,500 feet of coil. Consumption of coal, 1½ tons to every 32 miles. The boat has wide level promenade decks and ample saloon space. On the upper deck are five staterooms, pilot house, kitchen, and dining room.

Her builder is now finishing the interior decorations and fittings, and after another trial trip to Albany intends putting her on as a passenger boat between Poughkeepsie and Albany.

### Canals.

The Imperial Canal of China is over 1,000 miles long. In the year 1681 was completed the greatest undertaking of the kind in Europe, the canal of Languedoc, or the Canal du Midi, to connect the Atlantic with the Mediterranean; its length is 148 miles, it has more than 100 locks, and about 50 aqueducts; and in its highest part it is no less than 600 feet above the sea; it is navigable for vessels of upward of 100 tons. The largest ship canal in Europe is the great North Holland canal, completed in 1825. It is 124 feet wide at the water surface, 31 feet wide at the bottom, and has a depth of 20 feet; it extends from Amsterdam to the Helder, 51 miles. The Caledonian canal, in Scotland, has a total length of 60 miles, including 3 lakes. The Suez Canal is 80 miles long, of which 66 miles are actual canal. The Erie Canal is 350½ miles long; the Ohio canal, Cleveland to Portsmouth, 332; the Miami and Erie, Cincinnati to Toledo, 291; the Wabash and Erie, Evansville to the Ohio line, 374. The Suez Canal is 26 feet 4 inches deep, 72 feet 5 inches wide at bottom, 329 feet wide at water surface. Length a little short of 100 miles. The Panama Canal is to be 45½ miles in length.




THE STEAM CATAMARAN HENRY W. LONGFELLOW.

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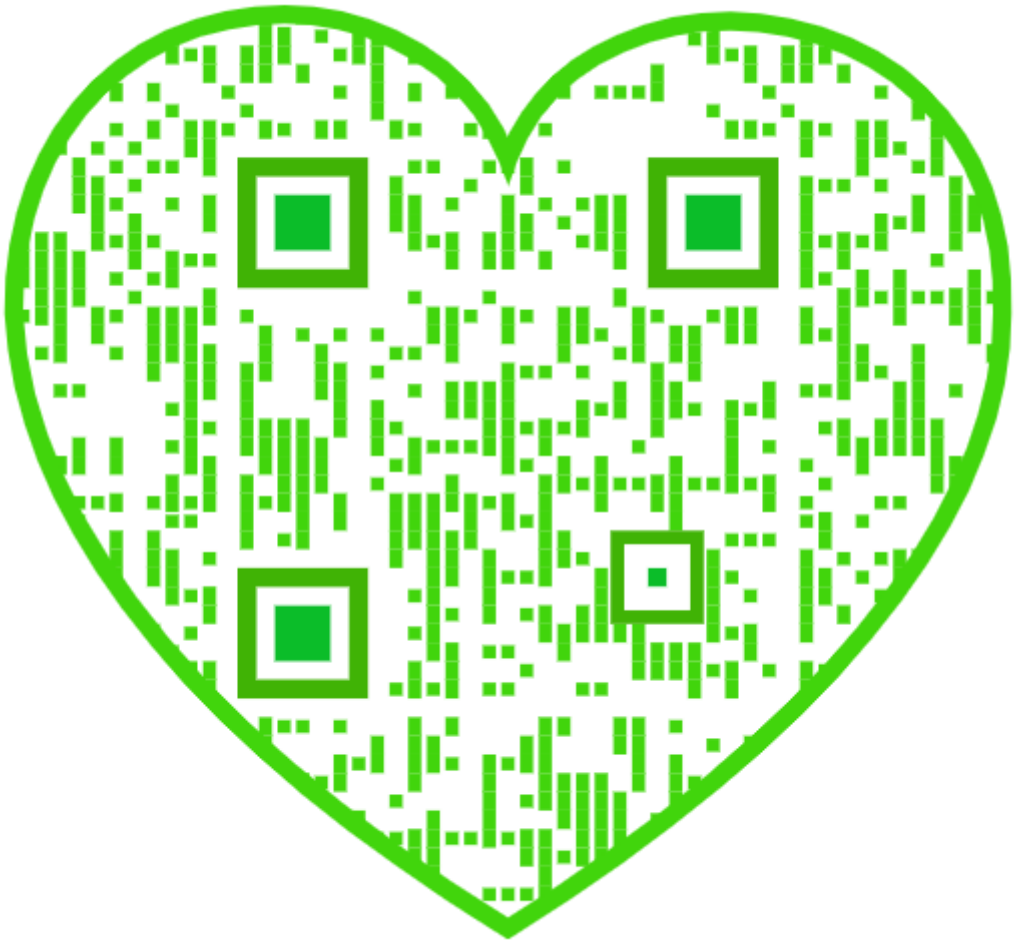

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NEW YORK, SATURDAY, AUGUST 2, 1884.


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### FINISHING BY PRESSURE.

Under this heading a paragraph appeared in the SCIENTIFIC AMERICAN of March 29, 1884, stating that drop forged articles of Norway iron had yielded to a permanent compression of one four-hundredth of an inch under a pressure of 800 tons. The result of this compression is to change the character of the material to a considerable depth, compacting its fibers so that the surface is almost a perfect one, requiring but a slight amount of polishing to bring out its clean, bright characteristics.

More noticeable results have been obtained on articles of malleable cast iron, the honeycombed, loose fiber of the reheated casting being forced in on itself, so as to greatly change its character. Under a pressure of 500 tons the malleable iron yields almost one-sixteenth of an inch, and becomes almost as solid as steel. Wrenches for agricultural implements, and for ordinary farm, stable, and home use, cast and made malleable by heating in boxes packed with pyrogenous oxide of iron, come out so soft and yielding in texture that they are almost like pewter. But put under this pressure they come to a rigidity that is surprising, resembling that of tempered steel.

A press for this work has recently been built which produces the pressure by the well known toggle joint or knuckle joint. The machine weighs seven tons; the head under which the pressure is given is re-enforced from the base by two five inch steel bolts; the dies are adjusted by screws moving an inclined plate or wedge that provides a solid bearing at all times and at every stage of adjustment. The throw of the die is one and a half inches, and is produced by the toggle joint driven by a lever from an eccentric, the shaft of which carries a gear wheel that is driven by a pinion which is to the wheel as one to to six. The lever from the eccentric does not engage with the toggle joint at its center, but by a connecting bar above the center, thus giving greater leverage than by the ordinary method.

### THE BARFF PROCESS FOR PRESERVING IRON.

The process known by the above name, of coating finished iron and steel with a permanent oxide, is being practiced in Hartford, Conn., with very gratifying results.

The method of producing the oxidized surface is quite simple. The articles to be treated are first highly finished and polished, cleansed from oil, and placed in a muffle, or oven, of boiler iron and heated to a red heat. Into the oven is projected the end of a steam pipe with rose nozzle or minute spray holes. This pipe lies in the furnace or in an adjacent oven in a coil, and is kept red hot and fed with boiler steam. This superheated steam is turned on to the red hot articles, and after an exposure of an hour a perceptible change has taken the place of the bright polish. Three hours produces a change similar in its penetration to the analogous casehardening of iron. There is not the slightest roughening of the surface; the first finish is all there, but the bright polish has given place to a dull, slaty smoothness, and this pleasant tint will remain in storm and sun, under steam and ice. But beyond this it is a beautiful finish; it would be elegant for the apron of a lathe or the cross head of a planer.

The articles thus coated resist acids and all the changes of temperature from steam at high boiler pressure—80 to 100 pounds to the inch—to freezing, and they resist all changes by weather exposure. The oxidized surface is as smooth as the original surface, however highly polished, but it is of a slaty black color, without any glisten. No prolonged tests have been made as to its permanance when worked metal to metal; but from other tests it is believed the wear will be inconsiderable when so tested. It is noticed that with cast iron this method of oxidizing appears to slightly permanently expand the article treated, and yet the oxide does not appear to be a superficial coating, but a chemical change of the surface of the iron, the expansion being probably due to the degree of heat employed.

### PORTABLE MACHINE TOOLS.

Portable machine tools are growing in favor in shops where heavy machinery is built. The Stow flexible shaft is a familiar illustration of the use of a rotary power at changing distances and changing angles from the driver, and the suspended weight and wire rope arrangement for producing rotary motion away from the driving shaft is also well known. But for heavy work, as driving a large boring bar, hand and ratchet labor has been used for years. Yet it is quite possible to do such work by power whatever the position or the distance, within reasonable limits, of the work from the driving shaft.

The boring bar is fitted with two or more gears of different numbers of teeth, which are driven—one at a time, according to the speed desired—by a pinion on a shaft that carries a pulley. A simple clutch engages the pinion with either one of the gears, the pinion and pulley shaft being moved by a lever through a curved slot in the frame to suit the differing diameters of the driven gears. The frame containing this shaft with pulley and pinion is attached to the work by means of a clamp just as in the using of a ratchet drill or a Scotch drill. In this there is nothing novel, but the novelty of the device consists in the attachment of the counter shaft to the ceiling. This shaft is driven by a round belt received on a scored pulley from any flat faced pulley on the main or on a counter shaft, and, by means of idler wheels on an angled arm, may be run in any direction. The entire counter and fixtures is held in place by a central bolt on which it swings, the bolt having a gimlet thread, like that of a coach screw, and being secured into the flooring timber overhead or into a flooring plank. This central screw permits the plank holding the counter to be swung in any direction, and when it is properly placed it is held by two similar screws at each end. A weighted idler may be used if required, when the distance between main and counter shafts is very great.

An excellent hand feed for a boring bar may be made by having a sliding collar on the boring bar, threaded a portion of its length on the outside, to receive a nut. The collar is held at any point on the bar by one or two set screws, and the periphery of the nut is either drilled with holes for the reception of a holding pin, or is furnished with fixed handles. The outer faces of nut and collar are trued off in the lathe and both of them are cylindrical. The traverse of the nut on the threaded collar may be any distance desired—from one to three inches perhaps is a useful limit—and to feed the bar forward as it bores, the nut should have a bearing against some temporary obstruction, as a piece of scantling or timber, a washer intervening between the face of the nut and the timber. The boring bar, the collar secured to it, and the nut all rotate together until the nut is held by the pin or a handle a portion of a revolution to force it forward. The collar may be moved and reset to place at will.

### POISONOUS COFFEE.

Most people think if they buy coffee in the berry, roast and grind it at home, they are sure of having obtained a healthy article—the Simon pure Java. But it may be they have been both deceived and poisoned. In Brooklyn the health inspectors recently found several well known coffee dealers who were in the habit of doctoring cheap Central American coffee so as to make it resemble and sell for the true Java. This was accomplished by polishing the coffee berries in rotating cylinders, with the addition of such stuffs as chromate of lead, Silesian blue, yellow ocher, Venetian red, drop black, burnt umber, charcoal, soapstone, chalk, and Prussian blue. Some of these substances contain lead, copper, and arsenic, and when the doctored coffee was subjected to chemical test these metals were found in poisonous quantities. The Health Board promptly ordered the discontinuance of this mode of coffee adulteration, and the enterprising dealers will now have to move across the river into New Jersey or some other State where their nefarious traffic may be conducted without interference of the authorities.

### The Successes and Tragic End of a Genius.

The career of M. Volkmar, the banker and speculator of Paris, who committed suicide in that city on July 22, was in many respects a remarkable one. A gentleman of New York who was connected with the Faure Electric Storage Company, in speaking of the late financier, said to a *Telegram* reporter to-day, July 24: "It is true that Volkmar began as a workman in M. Faure's electrical factory in Paris. While there he studied the Faure patent for the storing of electricity, which was a leaden plate immersed in a chemical bath, and he conceived the idea of manufacturing the accumulator on his own account. Leaving M. Faure's employment he went to England, where in 1882 he endeavored to get a patent for a so-called improvement of the Faure apparatus, his improvement consisting merely of a perforated plate instead of a solid one. The British Patent Office, however, refused to grant letters patent on so small an improvement, and, besides, there was doubt as to whether the additional surface gained by the perforation was a new idea. Notwithstanding his failure to obtain a patent, he formed a partnership with Mr. Sellon in the same year, and they began manufacturing the Volkmar-Sellon improved plate. They did well, and I imagine that Volkmar took out of the enterprise $500,000. Then his partners, disliking his methods of business, offered him a small sum to withdraw from the firm or threatened to force him out. He took the small sum and went to Paris.

The possession of so much money troubled him, so he consulted with M. Philipart, the most famous speculator who has appeared in Europe since George Law's day. Philipart gave him some points, and he speculated on the Paris Bourse. On the whole he was fortunate in this venture, and soon acquired a reputation for great strategic powers. Volkmar was active until his death, but lately he suffered so many severe losses that he became despondent. Volkmar's methods were peculiar, and his reputation for cunning caused him to be viewed with suspicion. He never failed to get into difficulties with all his confreres, except Philipart, with whom he did not dare to trifle. His is a remarkable life. Beginning without trade or profession, then becoming an electrician, appropriating his employer's ideas and making a vast fortune on them in a foreign country. A speculator, first successful and then a loser, and finally dying by his own hand. His system of storage is in general use even now in England and the United States."

[The body of Volkmar, formerly a resident of this city, was found in the Seine on the 22d ult., with a bullet through his head and his pockets rifled. He is supposed to have been murdered, as his own pistol was found in his house. The affair created a great sensation in the French capital. He visited New York in 1881.]

SOME recent trials show that very thin blades, as flat springs and cutlery blades, can be effectively hardened and tempered by heating them and thrusting them into a mass of mineral wax—crude paraffine. The needles of sewing machines and small drills have also been so treated successfully

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## ASPECTS OF THE PLANETS FOR AUGUST.

### JUPITER

is evening star until the 7th, and morning star the rest of the month. On the 7th, at 1 o'clock in the afternoon, he is in conjunction with the sun. He makes his bow to his evening audience, where he has been a shining light during the winter, spring, and summer months. As the curtain falls that hides him from view on the sun's eastern side, it rises on the sun's western side, and our giant brother soon emerges from the sun's eclipsing rays in a new character, that of morning star, a part that he will play faithfully and well, as those can testify who watch his rising in the eastern sky, and note his advent with increasing radiance a few minutes earlier each morning as the months roll on.

If we had eyes to see the position of the huge planet at conjunction, we should find that a straight line drawn from the earth, through the sun, would reach Jupiter, showing that he is then beyond the sun, and at his greatest distance from the earth.

If we could be transported to the vicinity, there would be startling things to behold in this vast sphere that almost make the hair stand on end even to think of.

Our staid planet, the earth, rotates on her axis once in 24 hours. As her circumference is about 24,000 miles, her axial velocity at the equator is about 1,000 miles an hour, or 16 miles a minute. Jupiter rotates on his axis, with a volume nearly 1,400 times as great as that of the earth, in a few minutes less than 10 hours. As his circumference is about 266,000 miles, his axial velocity, at the equator, is about 26,000 miles an hour, or not far from 433 miles a minute. When the planet was in a plastic state, this rapid rotation produced an effect that is plainly perceptible in the present outline. It caused a bulging out at the equator and a depression at the poles more marked and much greater than that of any other planet, so that his polar diameter is one-seventeenth less than his equatorial diameter, or in the neighborhood of 5,000 miles, more than half the earth's entire diameter.

And yet the Jovians, when in the passage of millions of years the planet becomes the abode of animate life, will no more feel the rapid movement of the monster planet than those who live at the earth's equator feel the more moderate speed that carries them around with the earth, and gives the sun a comparatively slow circuit in his diurnal course, instead of the rapid march that rules in the Jovian sky.

Matters must be rather mixed there, according to our ideas, with a day not half as long, only five hours from sunrise to sunset, and with a year nearly twelve times as long; for these are the conditions that hold sway in the domain of our distant neighbor. We like better the more dignified length of the earthly day, the more stately axial rotation of our little planet, and the quicker return of the revolving seasons. But the earth and all the other planets are results of the great nebulous mass that once extended far beyond the system's remotest bounds. The huge mass quickened into life, and threw off concentric rings that condensed into the sun and planets, and became the solar system. No man of science has yet been able to explain, in all its bearings, the law which ruled in the arrangement of the sun and the worlds that round him roll, to tell where the fuel comes from that keeps up the sun's fire, to show the reason why four giant spheres still holding portions of their primeval fires were established on the outposts of the system, or why four small planets roll on in their swifter course nearer to the great central orb. Theories are plenty on all these points, but conclusions are not convincing. We are prone to think that the earth holds a favored place among the planetary brotherhood. It is well to think so, and the position will not be disputed in the present attainments of astronomical science.

Jupiter has deigned to give little information concerning nimself in his last synodic circuit. Even the red spot, the peep hole into his glowing nucleus, is but a ghost of its former self. The cloud atmosphere has closed over it, and there will be no more tidings until another rift shall open, and show further glimpses of the chaotic mass, cooling and condensing into form and shape. We must wait until 1892 for Jupiter's next perihelion, when, being 46,000,000 miles nearer the sun than at aphelion, we may hope that the improved telescopes of the day will pick up something worth knowing. The process of world making will be a slow one on this princely planet, and the earth may have cooled down to desolation before the process takes perceptible form on this distant outpost.

The right ascension of Jupiter on the 1st is 9 h. 7 m.; his declination is 17° 11′ north; and his diameter is 29·6″.

Jupiter sets on the 1st about half-past 7 o'clock in the evening on the 31st he rises at a quarter before 4 o'clock in the morning.

### VENUS

is morniug star during the month, and is a charming object in the eastern sky during its course. On the 17th she reaches her period of greatest brilliancy as morning star, and observers who wish to behold the most lovely star that gilds the morn will find our celestial neighbor worth getting up early to see. She makes her appearance on the 17th, soon after 2 o'clock in the morning, nearly three hours before sunrise, casts shadows on objects illumined by her rays, and holds her visible presence in the sky, even in the noon-day radiance of the King of Day, to those who know where to look for her.

Venus has two periods of greatest brilliancy. One of them occurs thirty-six days before inferior conjunction, when she is evening star, as was illustrated on the 3d of June. The other takes place on the 17th, thirty-six days after inferior conjunction, when she is morning star. At this portion of her course she is 40 degrees from the sun, and about a quarter of her surface is illumined. After her first period, and before her second, she is nearer to the earth and larger in dimensions. But the illumined portion of her disk is less, and the loss of light more than counterbalances the increasing size. This is the time for the most satisfactory view of the Queen of the Stars. She is rapidly receding from our neighborhood, and many months will wax and wane before the favorable conditions will return.

The right ascension of Venus on the 1st is 6 h. 49 m.; her declination is 16° 26′ north; and her diameter is 49·4″.

Venus rises on the 1st at 3 o'clock in the morning; on the 31st she rises a few minutes before 2 o'clock.

### MERCURY

is evening star during the month. On the 23d, at 5 o'clock in the evening, he reaches his greatest eastern elongation, when he is 27° 21′ east of the sun. There is a moderately favorable opportunity for seeing him about that time, on an exceptionally clear evening after sunset in the west. His southern declination will, however, make him a difficult object, although his elongation is nearly as great as possible. Mercury must be looked for on the 23d in the constellation Virgo, about 20° northwest of Spica and 12° south of the sunset point.

A few hours before elongation the swift footed planet overtakes Uranus, passing 3° 5′ south of his slow plodding brother.

The right ascension of Mercury on the 1st is 10 h. 5 m.; his declination is 12° 55′ north; and his diameter is 5·6″.

Mercury sets on the 1st a few minutes after 8 o'clock in the evening; on the 31st he sets about a quarter after 7 o'clock.

### NEPTUNE

is morning star, and leads the planetary choir in being the first to make his appearance above the horizon. On the 14th, at 11 o'clock in the evening, he reaches the half-way house between conjunction and opposition, being then in quadrature, or 90° west of the sun.

The right ascension of Neptune on the 1st is 3 h. 25 m.; his declination is 16° 53′ north; and his diameter is 2·6″.

Neptune rises on the 1st about half past 11 o'clock in the evening; on the 31st he rises at half past 9 o'clock.

### SATURN

is morning star, and is growing brighter and more conspicuous as he approaches the earth. It is however the day of small things in his history. On the 17th, when Venus is brightest, he may be found about 30° northwest of the fairest of the stars.

The right ascension of Saturn on the 1st is 5 h. 19 m.; his declination is 21° 43′; and his diameter is 16·2″.

Saturn rises on the 1st at a quarter after 1 o'clock in the morning; on the 31st he rises at half past 11 o'clock in the evening.

### URANUS

is evening star. His course is uneventful, except for the conjunction with Mercury on the 23d.

The right ascension of Uranus on the 1st is 11 h. 45 m.; his declination is 2° 24′ north; and his diameter is 3·5″.

Uranus sets on the 1st not far from a quarter past 9 o'clock in the evening; on the 31st he sets a quarter past 7 o'clock.

### MARS

is evening star. He is of little account as he slowly travels toward the sun, his increasing southern declination being the only noteworthy event in his course.

The right ascension of Mars on the 1st is 12 h. 10 m.; his declination is 0° 45′ south; and his diameter is 5″.

Mars sets on the 1st at twenty minutes past 9 o'clock in the evening; on the 31st he sets at a quarter past 8 o'clock.

### THE MOON.

The August moon fulls on the 6th at six minutes after 6 o'clock in the evening, standard time. She is in conjunction with Neptune on the 13th, the day of her last quarter, and with Saturn on the 16th. On the 17th she makes a close conjunction with Venus, at 4 h. 37 m. in the afternoon, being then 23′ north. Although the nearest approach is invisible, the waning crescent and the radiant morning star will make a beautiful celestial picture on the morning of the 17th. The moon on the 20th, the day of her change, will be at her nearest point to Jupiter. The two days' old moon will pass 32′ north of Mercury on the evening of the 22d, an event that sharp eyed observers may behold. She will pass Uranus on the same evening, and close the circuit by a very close conjunction with Mars on the 24th, at 10 h. 28 m. in the morning. She will be at that time 10 north of Mars, but as the conjunction takes place in daylight, it can only be seen in the mind's eye.

It will be noticed that the moon passes very near Venus on the 17th, Mercury on the 22d, and Mars on the 24th. She will occult these three planets to observers whose places of observation are in line with her geocentric position; that is, as seen from the earth's center. These fortunate observers will see the moon, if the hour be favorable, hide Venus, Mercury, and Mars from view on the dates mentioned, the three occultations occurring within the limit of seven days.

## Photographic Items.

*Starched Glass.*—At a recent meeting in this city of the Society of Amateur Photographers, Mr. H. J. Newton gave the following recipe for making starched glass as a substitute for the ground glass of the camera, should the latter be accidentally broken:

| | |
|---|---|
| Water | 3 ounces. |
| Starch | 30 grains. |

The starch is well mixed and incorporated with the water, all large particles being reduced by pressure. The solution is now cooked or boiled very thoroughly for five minutes, strained through muslin, such as a handkerchief, and when cold is applied to the glass plate. The plate is leveled, the starch poured on and spread over to the edges and corners by a glass rod, and the plate is then drained and dried.

*Silvering Paper.*—Mr. Newton makes silvered paper which requires no fuming with ammonia, and yields fine purple tones, as follows:

| | |
|---|---|
| Water | 1 ounce. |
| Nitrate of silver | 40 grains. |
| Nitrate of ammonia | 30 " |
| Liquid ammonia | 3 minims. |

Upon this solution the plain or albumenized paper is floated for three minutes, and is then drawn off from the bath over the edge of the dish next to the operator. The wet paper adheres strongly to edge of the dish as it is drawn off. Bubbles are thus prevented from injuring the surface.

The bath should register from 54 to 56 by the hydrometer, and its strength may be reduced by usage to 25 grains of silver to the ounce before brown tones will be made. It is extremely important to keep it alkaline; it should be tested occasionally with red litmus paper, and if acid, more ammonia should be added.

*Potash Developer.*—Mr. F. C. Beach gave a formula for a potash developer, with which he had had much success. It is well adapted for instantaneous plates.

#### NO 1. PYRO SOLUTION.

| | |
|---|---|
| Warm distilled or melted ice water | 2 ozs. |
| Chem. pure sulphite soda (437 grs. to oz.) | 2 ozs. |
| When cool add: sulphurous acid | 2 ozs. |
| And finally add: pyrogallol (Shering's) | ½ oz. or 218 grs. |

which is done by pouring the sulphite solution into the pyro bath, repeating the pouring until the pyro is dissolved. The solution, which will now measure five fluid ounces, should be filtered, and will contain 44 grains of pyro to each ounce.

#### NO. 2. POTASH SOLUTION

is prepared by making two separate solutions as follows:

| | | |
|---|---|---|
| *a* | Water | 4 ozs. |
| | Chem. pure carbonate of potash (437 grs. to the oz.) | 3 ozs. |
| *b.* | Warm water | 3 ozs. |
| | Chemically pure sulphite soda (437 grs to oz.) | 2 ozs. |

*a* and *b* are next combined in one concentrated solution, a small quantity of which when mixed with the pyro will be sufficient to develop 3 or 4 plates. The strength of the solution will be uniform, and it will measure between eight and nine fluid ounces.

Supposing a plate to have been greatly overexposed, or properly timed, or the length of the exposure is unknown, to develop a 5x8 plate take 2 ounces of water and add thereto 3 drachms of No. 1 and from half to 1 drachm of No. 2, or the potash solution. Then pour the solution upon the plate; after a minute's interval, should no part of the image appear add a second drachm of No. 2, putting it into the graduate first and then pouring the developer from the tray into the graduate. The solution is again flowed over the plate, and if after a minute's interval no image appears, repeat by adding a drachm of No. 2 at a time until development commences. In this way the picture will be brought out very gradually, the development will be under perfect control, and can be prolonged until all details appear, without the slightest danger of fogging the plate. The principle involved is to add sufficient pyro at first to give proper density, and then add minute quantities of the alkali at stated intervals until the right strength is reached to commence the development.

In place of the No. 1 or the pyro in solution, dry pyro may be used with good effect, 6 to 8 grains being sufficient for 2 ounces of water.

If a plate has had what is termed a drop shutter exposure, or in other words an instantaneous exposure, to 2 ounces of water add 3½ drachms of No. 1 and 3 drachms of No. 2, increasing it a drachm at a time, in case the shadows fail to come out, up to 5 drachms.

The sky will appear rapidly, but the dark portions will develop gradually.

Brilliant, clear, bluish-gray quick printing negatives are produced with this developer on almost any brand of plate, the necessity of using clearing solutions is avoided, and all chance of stain to the negative disappears. The developing solution remains clear, and from 4 to 8 plates may be developed successively in it at one time. Should the negatives be too dense, the amount of No. 1 may be decreased a third to a half.

Among the advantages claimed for the developer are simplicity, certainty of uniform action, and production of clear negatives. The solutions being in concentrated form may be kept in small bottles, convenient for handling.

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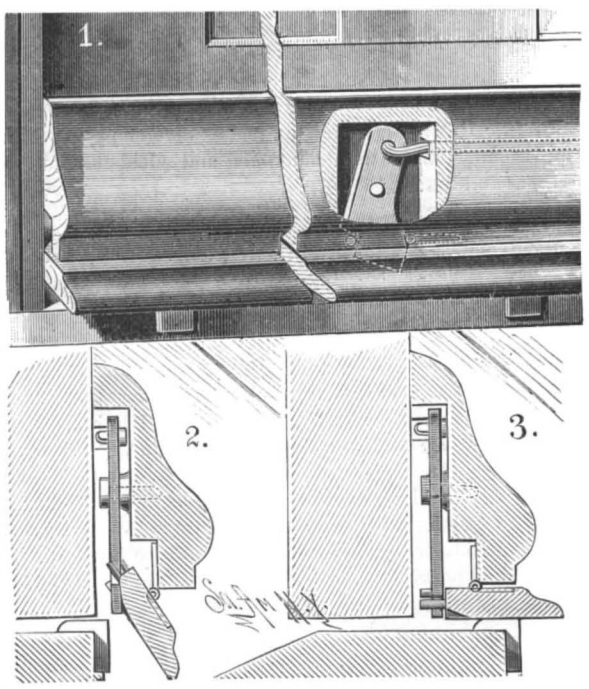
### WEATHER STRIP.

Secured to the front of the door a short distance above the bottom edge is a moulding having a longitudinal groove in the bottom. A strip is hinged to the bottom of the front of the groove in such a manner that it can swing up and down. Pivoted in a recess in the back of the moulding is an upright latch lever, which has a corner notch forming a shoulder at the lower end of one side edge, and a rounded projection at lower end of the other side. A stud projecting from the back edge of the strip passes into the notch; and the free end of a spring held in the strip rests against the rounded




BENNETT'S WEATHER STRIP.

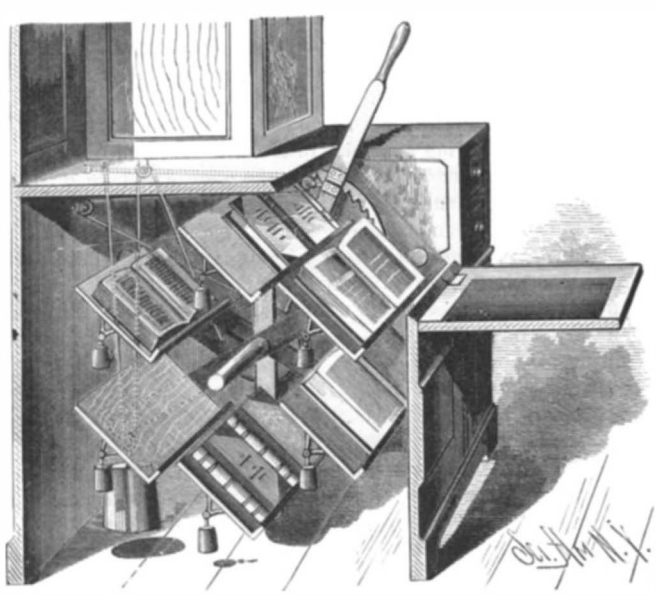
edge of the projection, thereby pressing the lower end of the lever against the stud. A rod extends from the upper end of the lever through a longitudinal groove in the back of the moulding, and projects from the inner side edge of the door, striking against a screw held in the casing. Secured to the top of the sill are angular clips or risers.

When the door is closed the strip hangs down in front of the sill, as shown in Fig. 2. If the door is opened, the under surface of the strip strikes against the risers, and it is swung upward when the stud passes into the notch and rests against the shoulder, as the spring presses the lever toward the stud (Fig. 3). If the door is closed, the end of the rod strikes against the screw, and is moved so as to force the lower part of the lever against the spring, whereby the stud is disengaged from the shoulder, and the strip drops. If the strip should not fall of its own weight, the lever pressing upon the spring would force it to drop.

This invention has been patented by Mr. W. D. Bennett, of Bedford, Iowa.

### REVOLVING BOOK STAND.

The shelves of the revolving book support, on which the books are placed, are journaled between the arms of spiders rigidly secured upon a shaft journaled in bearings secured in the lower inclosure of the bookcase. The shelves are provided with flanges for holding the books in place, and are



BOWMAN'S REVOLVING BOOK STAND.

feathered by counterweights, attached to the backs, that hold the shelves always in the proper position, that is, always facing the reader, no matter what position they may occupy with respect to the shaft, whether above or below, or in front or rear of it, or whether it be turned forward or backward. The weights are so attached that they may be adjusted so that the inclination of the shelves can be changed as desired.

Upon the shaft is a pulley over which passes a strong cord, which thence passes over a pulley attached to the back of the inclosure, thence around a pulley on the operating lever, and thence to a staple driven into the back of the inclosure. The other end of the cord passes from the shaft pulley up over a pulley secured to the top of the inclosure, thence under a pulley attached to a heavy weight, and thence to a staple driven into the top of the inclosure. The lever is fulcrumed upon the shaft, and is so arranged with reference to its distance of movement and to the size of the main pulley that its extreme movement will cause the shaft to make a complete revolution, bringing all the shelves successively to the front. This movement of the lever elevates the weight, which will act to turn the shaft in the reverse direction. By holding the lever at intermediate points, any one of the shelves may be held in front of the reader. The lever is held in any position by a pawl engaging with a segmental rack.

The revolving book support is especially serviceable where several authors are to be consulted, and besides effecting a saving of time does not necessitate frequent handling of the books.

This invention has been patented by Mr. D. D. Bowman, of Eureka, Cal.

### To Remove Foreign Bodies from the Eye.

Before resorting to any metallic instrument for this purpose, Dr. C. D. Agnew (*American Practitioner*, May, 1884) would advise you to use an instrument made in the following manner: Take a splinter of soft wood, pine or cedar, and whittle it into the shape of a probe, making it about the length of an ordinary dressing probe. Then take a small, loose flock of cotton, and, laying it upon your forefinger, place the pointed end of the stick in the center of it. Then turn the flock of cotton over the end of the stick, winding it round and round, so as to make it adhere firmly. If you will look at the end of such a probe with a two inch lens you will see that it is quite rough, the fibers of cotton making a file-like extremity, in the midst of which are little interstices. As the material is soft, it will do no harm to the cornea when brushed over its surface.

When ready to remove the foreign body, have the patient rest his head against your chest, draw the upper lid up with the forefinger of your left hand, and press the lower lid down with the middle finger, and then delicately sweep the surface in which the foreign body is embedded, with the end of the cotton probe. When the foreign body is lodged in the center of the cornea, it is most important not to break up the external elastic lamina; for if you do, opacity may follow, and the slightest opacity in the center of the cornea will cause a serious diminution in the sharpness of vision.

### HAY CARRIER.

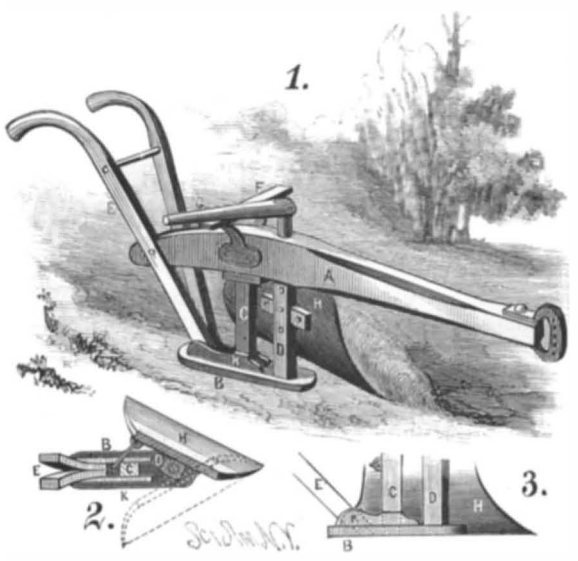
The track is supported from the frame timbers of a barn by angle bolts or other suitable means. The carrier frame is formed of two plates connected by bolts, and between the upper parts of which is the track. To the upper corners of each of the plates are pivoted rollers that rest upon the upper side of the track. To the rear lower corners is attached the end of the traction rope, which passes over a pulley pivoted between the lower forward corners, and is then led over guide pulleys to the place where the horse is to be attached. Upon the rope between its end and the forward pulley is placed a pulley, with the block of which is connected the hay fork in the ordinary manner. To the block is rigidly fastened the bail, which projects upward to trip the operating parts of the carrier.

Between the forward parts of the plates is pivoted a two-armed plate. The outer end of the upper arm, *b*, is rounded and has a hook formed upon its outer side edge; the lower arm, *a*, has a hook formed upon the outer end of its outside edge. Between the rear lower parts of the plates, and at a little higher level than the plate just described, is pivoted a three armed plate formed as clearly shown in the engraving. To the underside of the center of the track is attached a catch that is made double, so as to be used without change, when the carrier is upon either arm of the track. The catch has a dovetailed recess in the center of its lower side, the lower sides of its end parts are slightly concaved, and the outer ends are square. When the carrier is over the hay wagon, and the hook plates are in the position shown in Fig. 1, the pulley carrying the loaded fork rises to the carriers, the bail strikes the upper arm of the plate, *b*, and also raises the inner arm of the plate, *e*, thereby withdrawing the hook, *d*, from the catch and allowing the carrier to be drawn forward by the rope, the hook plates being in the position shown in Fig. 2. When the carrier is drawn back for another load, the end shoulder on the arm, *e*, strikes the end of the catch, which turns the hook plate and withdraws hook, *c*, from hook, *a*, releasing the bail and allowing the fork to descend for another load. This movement raises the hook, *d*, into contact with the catch, and lowers hook, *b*, into contact with hook, *c*, so that the weight of the arm, *b*, will hold the hook, *d*, in contact with the catch and prevent the carrier from being moved. This invention has been recently patented by Mr. Edwin Woodward, of Stryker, Ohio, and is being manufactured by Woodward Bros. of same place.

### SIDE HILL PLOW.

The side hill plow here shown is of simple and durable construction, and may be very easily handled. It is the invention of Mr. John Rapp, of Collinsville, Conn. A shoe, B, is securely attached to the beam by a standard, C, mortised into the shoe after passing between upright cleats fixed to the shoe; between the cleats the lower forward converging ends of the handles also fit, the handles being also mortised into the shoe, so that the standard and handles firmly hold the shoe against backward movement, while the cleats act as lateral braces. From the shoe the handles diverge and pass at each side of the beam to which they are bolted. The mould board, H, is bolted to the standard, D, which has side extensions to resist the strain.

This standard is pivoted in the shoe and in the beam, so

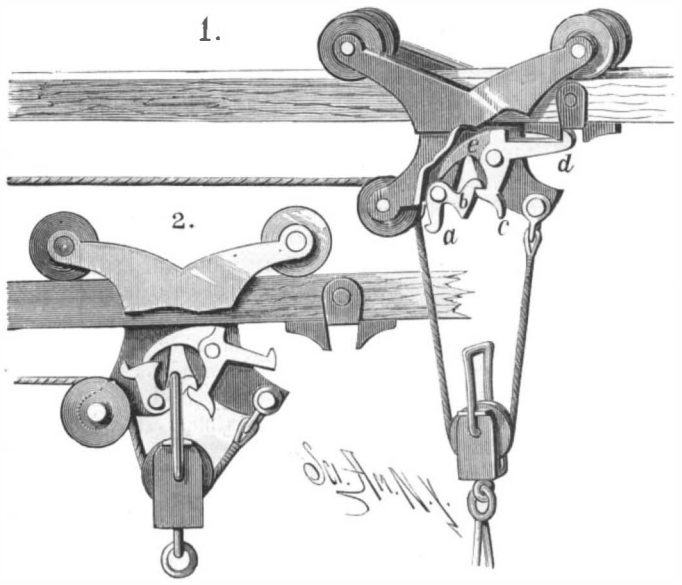



RAPP'S SIDE HILL PLOW.

that the mould board can be swung to either side for cutting both ways on the side hill. The mould board is turned by a lever, G, which is pivoted to the upper end of the standard and works over a cross bar, F, bolted to the beam, which serves as a fulcrum on which the mould board can be raised by the lever prior to reversing. The mould board is held in both positions by a hook hung on a staple fixed to the standard, C, and hooked into eyes fastened to the back of the mould board near its opposite edges, as clearly shown in Fig. 2.

### Kiln Drying Temperatures.

The following are the temperatures adopted by Franz Chodounsky, a well known Bohemian maltster. At the time of charging the kiln, a temperature of 108½° F. should be indicated by the thermometer hung underneath the upper floor of the kiln; two hours afterward the temperature should be 111°; at the expiration of three hours, 113°; and at four hours, 117½°; after five hours, 122°; after six hours, 133°; after seven hours, 144½; and at the expiration of eight hours, from 156° to 160°. The maltster ought not to allow a variation of more than 4° from the above temperatures. The temperature of the malt on the upper floor is thus under control, and ought to acquire the following temperatures at each successive hour: 87°, 84°, 86°, 99½°, 102°, 111°, 117½,° and 131°. The malt should reach the lower




WOODWARD'S HAY CARRIER.

floor of the kiln at 129°, and pass from hour to hour to the following temperatures: 117½°, 116½°, 130°, 133°, 147°, 171½°, 178°. The malt is charged at the rate of 1·25 hectoliters per square meter (= nearly 3 bushels per square yard); the thickness of the layer of grain should be a little over 3 inches at first; after four hours, about 2¾ inches; and after eight hours rather less than 2½ inches. On descending to the lower floor of the kiln, it should not exceed the last named thickness, and toward the middle of this stage the thickness should be reduced to 2 inches, and at the end of the kiln drying be a trifle less.

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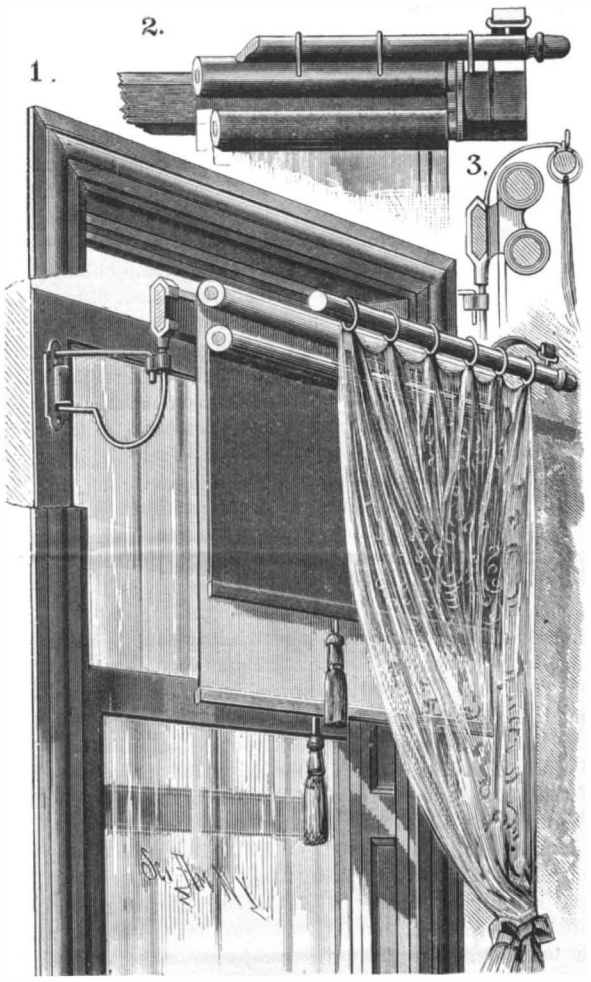
### SHADE AND CURTAIN FIXTURE.

On the inner surface of each side bar of the upper sash is fastened a metal plate, from which projects a lug that is provided with a vertical screw threaded aperture extending from top to bottom, and in which screws the end of a wire arm. This arm projects horizontally a short distance from the socket, and is then curved downward and outward, so that its free end projects beyond the plane of the window casing. In the upper part of the plate is held one end of a thin wire, which serves to put a strain on the arm and keep it from vibrating. The upper end of the wire arm passes through a sleeve, which is provided with an additional aperture for receiving the bent end of the thin wire. The sleeve is provided with a binding screw having a beveled end, which passes between the two wires so as to hold them firmly in place. On the upper end of the arm is held a clamp that is provided at the top and bottom with a V-shaped prong between which fits a bar extending transversely across the window frame. Held on this bar are similarly shaped clamps, from which project brackets provided with notches for receiving the end pivots of the shade rollers. If curtains are to be held in front of the bar, the curtain rod or window cornice from which the curtains are to be suspended is hung on the ends of hooks. (The arrangement of these parts is clearly shown in Fig. 2, which is a front elevation, and in the sectional view, Fig. 3.) The curtain rollers, the shade, and all the appliances are thus suspended from two or more arms. This construction is applicable in all cases where the window has a square top, or in windows having




INGALLS' SHADE AND CURTAIN FIXTURE.

a curved or arched top in which it is not desired to have the fanlight part covered by the shade; but if the fanlight is to be covered, and this shaded part is to be raised and lowered with the sash, a pointed or arched frame is used, on which the fanlight shade is secured.

Shades hung in accordance with this plan possess many advantages for ventilating both public and private rooms, and are especially adapted to sleeping rooms, sick rooms, and offices. By this means two or more shades can be used —a light one to admit light and cut off intrusive observation, a dark one to exclude light, or a colored shade to give such a tint to the light as may be desired. The fixtures are easily adjusted to windows of different widths and depth of jambs, and are applicable to bay windows, narrow face casings, mullioned windows with narrow mullions. By being attached to the sash they save the face casings from being injured.

This invention has been patented by Mr. John C. Ingalls, of Marquette, Mich.

### Sheep's Horn for Horseshoes.

A new horseshoe has lately been experimented with at Lyons, France. The shoe is made entirely of sheep's horn, and is found particularly adapted to horses employed in towns and known not to have a steady foot on the pavement. The results of the experiments have proved very satisfactory, as horses thus shod have been driven at a rapid pace on the pavement without slipping. Besides this advantage, the new shoe is very durable, and though a little more expensive than the ordinary one, seems destined sooner or later to replace the iron shoe, particularly for horses employed in large cities, where, besides the pavement, the streets are intersected by tramway rails, which from their slipperiness constitute a source of permanent danger.

### Hudson's Bay as a Grain Route.

The Newfoundland sealing steamship Neptune—the same which two years ago was sent in search of Lieut. Greely—sailed from Halifax, N. S., July 22, in command of Lieut. A. R. Gordon, of the Canadian meteorological service, for the purpose of establishing stations for scientific observations in Hudson's Bay. The stations are to be located in the following places, six on the strait and one on the west shore of the bay:

No. 1 at Cape Chudley, at the southeast entrance to Hudson strait. No. 2 on Resolution Island, at the northeast entrance to the strait, and about 45 miles across from station one. No. 3 at Cape Hope, or on the south side of about the center of the strait, and about 250 miles from stations one and two. This will be the chief point of observation. No. 4 will be located directly north of No. 3 on the north bluff of one of the islands close by, according to circumstances. No. 5 on the southeast end of Nottingham Island, about 200 miles from station four. No. 6 on the north side of Mansfield Island, some 150 miles from station five. Observations of the northern part of the bay will be made from this point. No. 7 at Fort Churchill, at the mouth of the Churchill River, on the west shore of the bay and about 600 miles from station six.

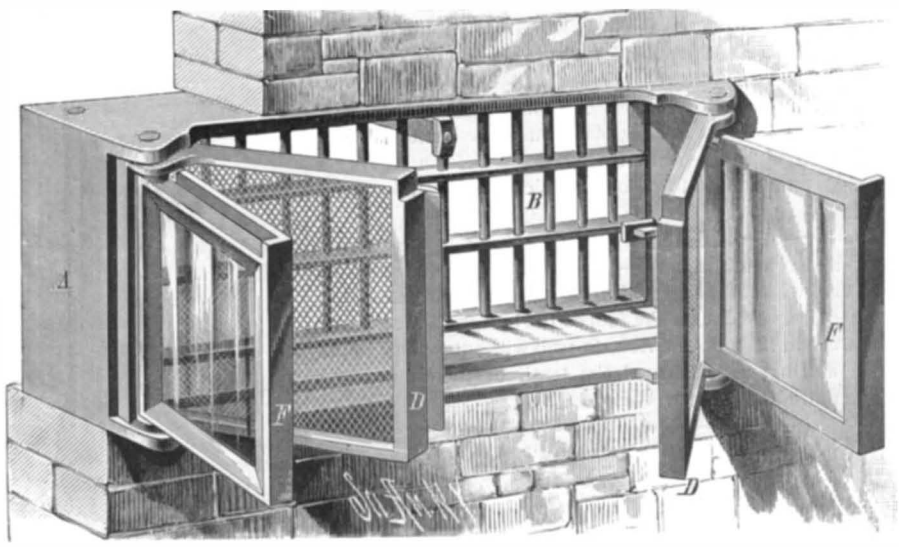
At all the stations the usual meteorological obeservations will be made; heavy tides will be measured; the drift of water will be noticed, and the conditions and state of the ice. Each station party will consist of two men and an Esquimau interpreter, besides the officer in charge, and sufficient provisions and fuel for fifteen months will be supplied. The observatories are made in sections, and will be taken out by the steamer, and put up on the sites selected by the commander as the vessel progresses through the strait. Next year these stations will be revisited, and other parties left in charge. The most important work the parties will be called upon to perform will be to carefully watch and note the breaking up of the ice, the tides, and all other characteristics pertinent to navigation.

The sum of $70,000 has been appropriated by the Canadian Government to make these explorations, but the immediate end in view is practical rather than scientific. It is thought that, notwithstanding all the unfavorable reports so far received, it may be found that Hudson Strait is open a sufficiently long period in the late summer and early fall of each year to make it profitable to ship grain by that way to Liverpool from the Winnipeg Valley, which is directly connected with the western shore of Hudson's Bay by the Nelson and Churchill rivers. Lieut. Gorringe investigated this question about three years ago, on behalf of the Northern Pacific Railroad Company, but he reported that any successful trade in this way was impracticable, on account of the fogs as well as the ice, which would hardly leave an average period of six weeks for tolerably safe navigation, while even this period varied with the season, and during such time navigation was often interrupted. The Manitobans are not yet convinced, however, and the recent rapid growth of that province has induced the Dominion government to send out this expedition to make a more thorough investigation.

### COMBINATION CELLAR GRATE.

An invention recently patented by Mr. L. N. Byar relates to gratings that are used for cellar windows, the object being to combine an inner door or screen with the outer frame and grating without employing the usual wooden frame. At each end of the inside of the frame, A, are pivoted the frames, D and F, the former being provided with screens and the latter with panes of glass. When either or both of the frames are closed, they are held by a single turn buckle. By this means the window opening may be tightly closed by the glazed frames, or upon opening these proper ventilation will be effected through the screens without permitting the entrance of insects, and by opening the screens a still freer flow of air will take place.

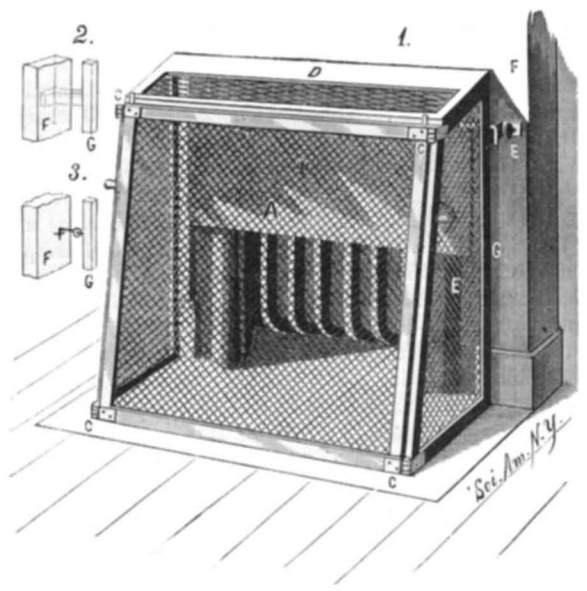
In hanging the frames, the usual outer wooden frames are dispensed with. On the frame, A, and on each of the screen frames are formed ears, openings being made in both sets. On the frames, F, are pins, the upper pin being longer than the lower one, and the upper bars of these frames have a recess formed adjacent to the pin. In fitting the parts together, the frame, D, is first adjusted in place, when the upper pin is passed through the openings as far as the recess will allow. The lower pin can then be swung over the openings in the ears, so that on depressing the frame the pivoting will be effected. When coal, wood, etc., are to be put in the cellar, the outside grate is unlocked and swung outward. The many advantages of these grates, which are being manufactured at the foundry and machine works of Byar & Bro., of Pottstown, Pa., will be readily perceived.




BYAR'S COMBINATION CELLAR GRATE.

### FOLDING FIREPLACE FENDER.

The front, A, and side panels, E, are of woven wire stretched on suitable frames, the sides being inclined backward from the bottom upward on the front edge. The sides and front are hinged together for holding the fender together when put away and for extending it to be put in use. The top panel, D, which may be partly of wire and partly of sheet metal or wholly of wire, is retained by studs projecting upward from the top of the front. On the bars of the side panels next to the fireplace front and at a suitable distance below the top are clasps, F, to connect with the front plate




SHOEMAKER'S FOLDING FIREPLACE FENDER.

of the fireplace by thumbscrews, as shown in Fig. 1, or by spring clasps, as shown in Fig. 2, to hook behind the edge of the plate. To act as a blower to increase the draught when necessary, there is a sheet metal back plate, K, having a lug at each end, which drops down between the fender and the fireplace. Screw eyes may be attached to wood mantels for connecting the fender by hooks, as in Fig. 3. Attached to the side frames are handle studs that afford a convenient means of lifting the fender when it is to be taken from the fireplace or replaced. When not in use the fender can be folded compactly, and when in place it presents a neat appearance, and owing to the sloping point is not in the way and is not liable to catch the clothes of persons near it.

This invention has been patented by Mr. I. W. Shoemaker, of Rosston, Pa.

### Antimony in Clothing.

The *Centralblatt fur Textil Industrie* records the fact that antimony is to be found in cotton yarn which has been dyed with aniline colors, and remarks that unless great care has been taken in the cleansing of the yarn, it is possible for such a quantity to remain as to be injurious to the skin. Experiments made on different classes of yarn produced results varying according to the nature of the dyeing substance. The samples in which hot water acted as a dissolvent showed only a small proportion of antimony, the highest proportion being found 0·014 per cent. The proportions of antimony which were soluble in muriatic acid varied from 0·036 to 0·31 per cent of the weight of the yarn. Of course, practically speaking, only the portion soluble in water comes under consideration, but as a pair of long stockings weighs about 2 to 2½ ounces, the antimony would represent an appreciable though minute quantity, the effect of which is a question, it is remarked, for medical experts to decide.

EMIGRATION from Italy to foreign countries is yearly increasing; in 1883 it reached, according to official statistics, 169,101, mostly peasants and the lowest lazzaroni. The two Americas receive a little over a third of all the emigrants, and latterly a drift from the Buenos Ayres coast to the United States has been noticeable.

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### Why Business Men Fail.

Let me give your readers, says a correspondent of the *United States Economist*, the benefit of the replies I have received from leading men of our country to the question, "What, in your observation, have been the chief causes of the numerous failures in life of business and professional men?"

Governor St. John answers: "Idleness, intemperance." Alexander H. Stephens answers: "Want of punctuality, honesty, and truth." Hon. Darwin R. James answers: "Incorrect views of the great end and aim of life. Men are not contented to live plain lives of integrity and uprightness. They want to get ahead too fast, and are led into temptation." President Bartlett, of Dartmouth College, names as causes of failure: "Lack of principle, of fixed purpose, of perseverance." President Eliot, of Harvard, replies: "Stupidity, laziness, rashness, and dishonesty." Dr. H. M Dexter, of the *Congregationalist*, answers: "1. Want of thoroughness of preparation. 2. Want of fixedness of purpose. 3. Want of faith in the inevitable triumph of right and truth." Anthony Comstock's answers are: "Unholy living and dishonest practices, lust and intemperance, living beyond one's means." Mr. H. E. Simmons, of the American Tract Society, replies: "Fast living, mental, spiritual, and bodily; lack of attention to the details of business." General O. Howard answers in substance: "Breaking the divine laws of the body by vice, those of the mind by overwork and idleness, and those of the heart by making an idol of self." Professor Homer B. Sprague, of Boston, answers: "1. Ill health. 2. Mistake in the choice of employment. 3. Lack of persistent and protracted effort. 4. A low ideal, making success to consist in personal aggrandizement, rather than in the training and development of a true and noble character." Dr. Lyman Abbott answers: "The combined spirit of laziness and self-conceit that makes a man unwilling to do anything unless he can choose just what he will do." Mr. A. W. Tenney, of Brooklyn, replies: "Outside of intemperance, failure to grasp and hold, scattering too much, want of integrity and promptness, unwillingness to achieve success by earning it in the old-fashioned way." The attorney-general of a neighboring State replies: "Living beyond income, and speculating with borrowed funds; unwillingness to begin at the foot of the ladder and work up. Young men want to be masters at the start, and assume to know before they have learned." And another reason in the same line: "Desiring the success that another has, without being willing to work as that man does. Giving moneymaking a first place and right-doing a second place."

Judge Tourgee, author of "A Fool's Errand," considers the frequent cause of business collapse to be: "Trying to carry too big a load." As to others, he says: "I don't know about a professional man's failing, if he works, keeps sober, and sleeps at home. Lawyers, ministers, and doctors live on the sins of the people, and, of course, grow fat under reasonable exertion, unless the competition is too great. It requires real genius to fail in either of these walks of life." Hon. Joseph Medill, ex-mayor of Chicago, answers: "Liquor drinking, gambling, reckless speculation, dishonesty, tricky conduct, cheating, idleness, shirking hard work, frivolous reading, lack of manhood in the battle of life, failure to improve opportunities."

Among the causes of failure given by my correspondents many may be classified under the general fault of wavering, such as "wavering purpose," "non-stick-to-it-iveness," "failure to grasp and hold," "scattering too much," "trying to do too many things, rather than stick to the one thing one knows most about." A young man spends seven years in a grocery store, and when he has just learned the business he concludes to go into dry goods. By failing to choose that first he has thrown away seven years' experience. Probably, after learning the dry goods business, he will conclude to become a watchmaker, and at last become a "jack-at-all-trades," good at none. A prominent merchant says: "Nearly all failures in legitimate business come from not serving an apprenticeship to it," that is, from leaving a business one knows for another which he does not understand.

Another cause of failure is the disposition to escape hard work, and get rich in haste—"desiring the success another man has, without being willing to work as that man does, and begin, as he did, at the foot of the ladder." How many who were in haste to get rich, to reap without patient industry in sowing, have learned the truth of the old proverb: "The more haste, the worse speed"!

### Photographic Printing in Colors.

In this process it is necessary to use *colored negatives*—that is, ordinary negatives which have been hand painted in their proper tints with transparent colors.

1. Take a piece of ordinary sensitized paper, and wash it to remove any free silver nitrate.

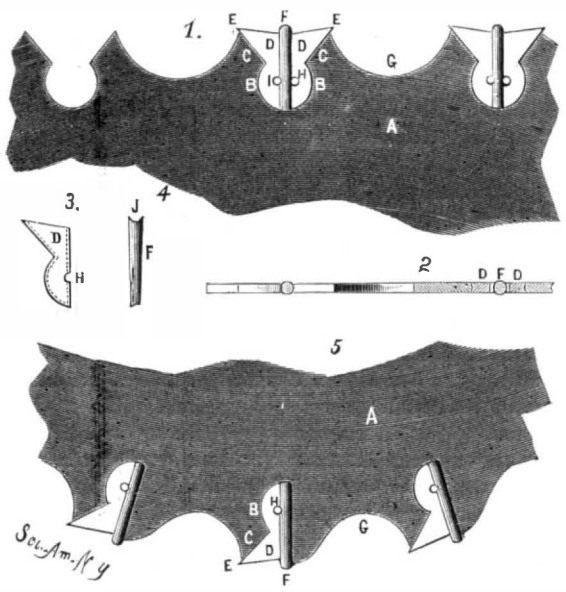
2. Place the washed paper in a solution of protochloride of tin, and expose to weak light until the silver chloride is reduced to subchloride, and the paper assumes a uniform gray color.

3. Float the paper in a mixed solution of chromate of potash and sulphate of copper, and dry in the dark.

The paper is now sensitive to all the colors of the spectrum, and by printing on it with a colored negative the colors of the negative will be reproduced. After printing, wash with cold water, and dry.—*J. Sherlock, St. Helen's Photo. Assoc.*

### INSERTIBLE SAW TOOTH.

The accompanying engraving shows an invention recently patented by Mr. John H. Brown, of South Trenton, New York, which provides crosscut and circular saws capable of doing the greatest amount of work with the least effort and at the least expense. The inner parts, B, of the seats for the teeth are made circular, and the outer parts, C, are made flaring, forming inclined shoulders. Two of the teeth, Fig. 3, are placed in each seat, and are so formed as to fit against the curved and inclined walls. The edges of the teeth are grooved to fit upon the correspondingly shaped edge of the saw plate, thus preventing lateral movement. The

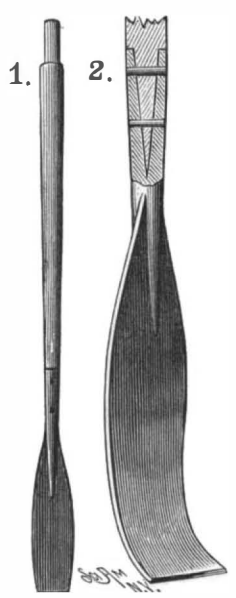



BROWN'S INSERTIBLE SAW TOOTH.

rear edges are straight and at right angles to the length of the saw. The teeth are made of such a size as to leave a narrow space between the straight edges of each pair to receive the tracer spur, F, Fig. 4. These spurs are made of hardened steel wire, a gauge or two thicker than the saw plate, and are slightly tapered upon the outer sides to prevent binding. They fit into grooves in the straight edges of the teeth, are a little longer than the teeth, and their outer ends are notched in line with the saw plate to form points or spurs, which trace parallel lines in the bottom of the kerf, thereby forming a kerf a little wider than the thickness of the saw plate, so that the teeth will not require setting. The inclination of the points, E, is such that they will operate upon the wood in the same manner and at about the same angle as the iron of the ordinary hand plane. In the edge of the saw plate, between the teeth, are formed semicircular recesses to receive the shavings and carry them out of the kerf. In the inner part of each tooth is a hole, H, I, to receive a rivet to press against the tracer spur and lock it in place. With this construction the teeth will not require to be either set or filed, and when dulled or broken can be readily removed and replaced with new ones at a trifling expense.

### IMPROVED OAR.

The blade of the oar is made of sheet metal and is provided at its upper end with a tapered metal socket for receiving the tapered stock of the bar. The socket is firmly held by




STANTON'S IMPROVED OAR.

rivets, as shown in Fig. 2. The blade can be made flat and in the same plane throughout, or it can be constructed to form a spoon oar, or its side edges can be rounded to form a paddle for a canoe. An oar constructed after this plan possesses many excellent features: the metal blade is more durable than a wooden one, it will not warp nor split, springs easily, and the upper end of the blade and the lower end of the socket can be made very slender, so as to cause very little back water.

This invention has been patented by Mr. George B. Stanton, of Long Lake, N. Y.

### Tempered Glass.

It is not very long since the discovery of M. Alfred de la Bastie filled all our newspapers with paragraphs, more or less ridiculous, about the properties of this glass. Some claimed it was malleable; others that it could not be broken. In fact, tempered glass was called upon to supersede all other materials. The excitement being over, tempered glass may now take its rank among valuable inventions, subject, however, to many defects in its present state.

The process of tempering glass, as is well known, consists in heating a piece of glass, say a window pane, to such a degree as to approach malleability, but not hot enough to lose its shape; the glass in this state is instantly plunged into a bath composed of fatty and resinous matter, which is heated and maintained liquid at a temperature ranging from 300° to 600°, according to the quality of the glass The difference of temperature between the malleable state, about 1,400°, and that of the bath constitutes the temper.

Glass in the plastic state, when plunged into cold water, will fly to pieces if dropped indiscriminately, but if a piece of very fluid glass is allowed to fall into water in the shape of a tear or drop, it will be perceived that the outside of the glass cools at once, while the inside remains partly fluid for some time, as can be distinguished by the red color showing through the water. This cooling will continue until the mass is perfectly solid. This indicates that the outside layer becomes at once condensed by cooling, while the inside remains fluid and consequently more distended. This cooling process goes on, the outside layer compressing the next adjoining, until the whole mass is thoroughly cooled. This peculiar form and state of glass is known as Prince Rupert's drops. Though a hard blow may be struck upon the thick part of these drops, it has no perceptible effect, but if the thin tail end is ruptured the whole mass instantly flies to pieces. The glass appears to be under a great state of tension, and the least rupture of the equilibrium, such as the breaking of the slender thread terminating the drop, is sufficient to destroy the mass.

Until the discovery of tempered glass by M. De la Bastie, it had always been considered that unless a lamp chimney or any other piece of glass was perfectly annealed, differences of temperature brought on suddenly would invariably cause a breakage. The Bastie glass would seem to prove this view to be erroneous, as the tempered glass can sustain sudden and extreme changes of temperature without breaking. Molten lead has been poured into a glass bowl or tumbler without producing a fracture. A piece of plate glass tempered by the Bastie process, having been heated among coals, was suddenly plunged into cold water without producing any effect. This experiment, repeated five times in succession, did not seem to impair the qualities of the glass, for on dropping it from a fifth story window it did not break. It may be said, however, that if in the heating the temperature should reach the point at which it would be annealed, the temper would be destroyed. This action does not seem to take place when the period of reheating is not continued too long. A plate of glass 6¼x4¾ inches and three-sixteenths inch thick could only be broken under the shock of a weight of 7 ounces falling 13 feet, while an ordinary piece of glass of the same dimensions would break under half of that weight falling about sixteen inches.

M. Siemens, of Dresden, says that the strength of glass is increased fifty times by being tempered. A bent plate of glass laid upon the floor with the convex side upward is capable of resisting the weight of an ordinary sized man without breaking. The glass while subjected to the weight will flatten out, but as soon as the pressure is removed it will spring back at once to its original shape. Hardened glass seems to be less dense than ordinary glass; it is harder, however, and is more difficult to cut by the diamond and tempered tools; it also possesses a much superior elasticity over the ordinary glass.

Since tempered glass, however, cannot be cut with the diamond without flying to pieces, its use must necessarily be limited to definite sizes not requiring to be modified; this is quite a drawback to its use. It would seem, however, that some of the defects have already been overcome, for at the Paris Exposition quite a display of tempered goods was made by the *Societe Anonyme du Verre Trempe*, of Paris. Among other things was quite a display of druggists' and chemical glassware, mortars, pestles, beakers, covered bowls, funnels; also a variety of plain and cut glass tumblers, goblets, decanters, globes, and chimneys; opal plates; a depolished bowl with cut facets; colored glass, engraved, cut, etc. It is said that the making of articles varying in thickness is hazardous, as many of them are apt to fly to pieces either in the making or cutting.—*Glassware Reporter.*

### Medical Photography.

Dr. A. L. Cory says: "As to the use of photographic outfits in medicine, I would say I find mine a great benefit. I have used it in cases of skin diseases, small pox, spina befida, etc., and can see now where I should have kept photos of many cases if I had possessed it before. While in charge of Lake health department I took frequent copies of small pox cases. It is so little trouble to keep the plate holder filled and the camera in one corner of the consultation room. A photo of any case can be had at a minute's notice, the plate to be developed when convenient. I frequently take mine in the buggy when called to a case I think may be interesting, and use it if opportunity offers. Nothing that I know of offers us so easy and accurate a method of recording interesting cases."

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## Correspondence.

### Keeping Beer with Oil.

*To the Editor of the Scientific American:*

In this country we continually have thunderstorms from March to October. For months together a night never passes without one more or less severe, generally the latter. I always keep beer on draught, and find it *never* goes sour if it is hermetically sealed by having *oil* poured on the top. This should be poured into the barrel when tapped. On the other hand, without the oil the beer does not keep a week. ASSAM.

Assam, Bengal, April 30, 1884.

### How Earthenware is Made.

The Trenton potters use for their white ware, clays from the State of Delaware and Delaware County, Pennsylvania, which are totally or almost entirely free from oxide of iron. These clays are found in the place of their first deposit, and therefore contain all the sand of the gneiss or granitic rock of the disintegration of which they are the product. New Jersey clay, which is not found free from oxide of iron, but is very much more plastic, is mixed with these clays to render them manageable. All of the seggars, however, that are used in the Trenton potteries are made of New Jersey fire clays. The value of good fire clay to the potter will be understood, when it is considered that true porcelain could not be made in England, owing to the scarcity of a cheap material for seggars, ten per cent of the ordinary seggars being lost in the firing of true porcelain.

The process of preparation of clay for making good ware is as follows: After having been washed, the clays, reduced to the consistency of cream, are separately passed through lawn sieves, and are then mixed by measure in proportions that will give the required plasticity in the mixture. The mixture is now allowed to evaporate in troughs or "slip kilns," under which furnace flues run. When a uniformly doughy mass is obtained, the prepared clay is taken from the troughs, passed through a pug mill, cut into rough lumps, and is stored for a time not exceeding one year in a damp cellar, where it disintegrates by fermentation. The process of preparing the rotted clay for actual use is called "slapping" or "wedging." A large mass of clay is placed upon a bench, and the workman, cutting it through with a wire, lifts up the upper half, turns it about half way round, and throws it down violently upon the half which remains on the bench. The operation is repeated until the mass is intimately mixed, and every vesicle containing air has been broken and the air expressed.

The process of preparing porcelain paste is much the same as that employed for the stoneware paste, a stirring vat being employed to knead up the mass of water with clay before it passes to the subsiding vats. The grinding of the feldspar, chalk, broken porcelain, etc., which enter into the composition of the paste, must be well done, and all particles of iron, mica, and such foreign substances must be removed. The ingredients are mixed either in the form of slip or in the form of dry powder, the latter being the least convenient method, but more accurate. Analysis of the best Sevres porcelain manufactured between the years 1770 and 1836 gave this result:

| | |
|---|---|
| Silica | 58·00 |
| Alumina | 34·00 |
| Lime | 4·5 |
| Potassa | 3· |
| | 99·5 |

The mixture is freed of superfluous water by being subjected to hydraulic pressure in closely woven sacks.

There are three methods of fashioning the innumerable and various articles made from clay. The first and most ancient is that of throwing, in which the thrower or jigger throws down a lump of clay upon the revolving table of his lathe. Using both hands he works the lump into the shape of a rude cone, and then flattens the mass within a few inches of the table, the object of the operations being to force out any air bubbles that may still remain in the clay. By means of his hands and fingers, and referring continually to measuring sticks, he fashions the vessel according to a model or after his own fancy.

Few jiggers are employed in our potteries, the best example of this art being found in the country earthenware potteries. Presswork is the method commonly employed. This work is done in moulds made of plaster of Paris, one-half of the pattern being formed in one side of the mould, and the other half in the other side. The two moulding pieces are then fitted accurately together. Handles are moulded separately and fastened on with slip. Handles of teapots, fluted solid rods, and all such slender ornaments are made by forcing clay, under great pressure, through a narrow hole in the bottom of a piston previously charged with dough clay. As the thread of clay issues, it is cut in suitable lengths. From these pieces, the ornaments are bent and fastened on with slip by the handlers. For articles of very irregular shape a method called casting is employed. The two halves of the mould are fastened together, and slip is poured in until the cavity is quite full. As the moulds are previously thoroughly dried, the absorbent power of the plaster soon abstracts the water and makes the coating of clay next to it stiff and doughy. When the liquid is now poured out, this doughy coating remains. If each half has been cast separately, as is the usual practice, the halves are allowed to dry to the green or most tenacious state, and are then joined with slip. The method of casting is that usually employed in moulding porcelain.

Another method of forming articles in porcelain we may call the crust method. The dough is spread with a rolling-pin upon a moistened sheepskin, and is transferred over the mould by lifting it carefully upon the skin. All pieces, whether pottery or porcelain, are finished upon the lathe when they have dried to their greatest tenacity. A moist sponge and knives are the implements used in turning. Owing to the low degree of tenacity possessed by the porcelain paste, hardly more than one-sixtieth as many pieces can be finished for firing in porcelain paste as in stoneware paste, by the same force in the same time.

Seggars are vessels of fire clay, in which all articles except the commonest earthenware are burnt. They are fashioned of clay slabs roughly cut with a spade and compacted with a mallet, over an oval-shaped form. The bottom is put on separately and the whole is fired. The ware is placed in seggars, which are piled upon one another so that the bottom of each succeeding seggar forms a cover for the one immediately below. Only a single article of porcelain paste can be burnt in a seggar, and the bottom of the seggar must be sprinkled with infusible quartz sand to prevent adhesion between the porcelain and the seggar. Seggars for stoneware may be filled, the pieces being separated by variously shaped cockspurs, etc. Stoneware, W. G. ware, and kindred wares are raised in the kiln to a white heat, which is continued for thirty-six hours. The fires are then allowed to cool, the seggars removed, and the biscuit taken out. This biscuit is very porous, and, when dressed of all rough prominences, is ready for the glaze.

The glaze for these wares is usually a "frit," composed of ground feldspar, twenty-five per cent; ground quartz, twenty-five per cent; sal soda, twenty-five per cent; plastic clay, fifteen per cent; and boracic acid, ten per cent; which is fused in a reverberatory furnace, ground in a mill, and mixed with water in glaze tubs. The biscuit is dipped in the slip contained in these tubs, the marks are affixed, and the articles allowed to dry. Since the glaze is much more fusible than the ware, a cherry-red heat is sufficient to fuse the glaze. A porcelain furnace has two stories. In the upper the ware is first fired, the ware being converted into a soft, as distinct from a hard or stoneware biscuit. This biscuit is dipped in a glaze of ground quartz, feldspar, lime, and porcelain clay. In the second firing, which is done in the lower story of the kiln, the glaze and the biscuit are fused together, producing a translucent mass. Stoneware, granite ware, etc., are chiefly decorated by a process called printing or transferring. The intended design is engraved upon copper or stone, and is then transferred in transfer ink to the surface of a prepared elastic sheet. This sheet is stretched on a frame until the design is brought to the size of the article to be decorated. The pattern is now retransferred to zinc plate by the ordinary process of lithograph printing. The zinc plate is engraved by electricity, and then presents all the gradations in depth and tone of the original design. The printed pattern is applied either to the biscuit or above the glaze, and may be finished by hand and brush after the printing. Decoration is always applied to porcelain over the glaze, the ware being afterward placed in a muffle and subjected to a heat just sufficient to vitrify the colors, which must be of earthy character so as to form colored glasses.—*Glassware Reporter.*

### Benzene a Product of Paraffine.

By Drs. Armstrong and Miller, communicated to the Chemical Society.—The authors described the results of their examination of the liquid obtained on compressing oil gas, such as is made by passing the vapor of petroleum through highly heated retorts. They point out that their material is in every respect similar to that examined by Faraday in 1825; and in which he discovered benzene. Besides benzene and its homologues, the liquid from oil gas contains hydrocarbons of the ethylene and acetylene series. It is noteworthy, they say, that the latter are none of them true homologues of acetylene, as they are incapable of forming metallic compounds analogous to acetylide of copper. They are probably all derivatives of allene ($CH_2.C.CH_2$), the isomer of allylene or methyl-acetylene. From the fractions boiling below benzene, two hydrocarbons of the acetylene series have been isolated, methylallene ($CH_3CH.C.CH_2$), identical with the crotonylene separated by Caventon from the mixture of hydrocarbons condensed by compressing coal gas, and hexoylene ($C_6H_{10}$), identical with that described by Schorlemmer.

The crystalline tetrabromides of these hydrocarbons have both been obtained in large quantity in a pure condition. As yet it has not been found possible to isolate the intermediate hydrocarbon—$C_5H_8$. The fractions below benzene contain two olefines—viz., amylene and hexylene. A study of their oxidation products shows that both of these are the normal hydrocarbons. The amylene furnishes, on oxidation with permanganate, normal butyric acid. The hexylene is converted into normal valeric acid. In other words, the amylene is normal propyl-ethylene; the hexylene, normal butyl-ethylene. In conclusion, it was pointed out that this is an extension of the investigation of Thorpe and Young. By heating paraffine under pressure at a comparatively moderate temperature, they obtained a mixture, with corresponding olefines, of lower (normal) paraffines down to pentane. At the higher temperature of the oil gas retorts, the paraffines are completely converted into olefines, acetylenes, benzenes, etc. It is not improbable, they state, that the benzenes are products in a direct line of the action of heat on the paraffines; and that they are not built up, as has been supposed, from hydrocarbons of the acetylene series.

## DECISIONS RELATING TO PATENTS.

### United States Circuit Court.—Western District of Pennsylvania.

STUTZ *v.* ARMSTRONG & SON.—PATENT COAL WASHING MACHINE.

Acheson, J.:

Where it appears from the original papers in a case that a certain feature was within the contemplation of the inventor as a valuable element in a patentable combination, and it is proved that a claim embracing such feature was erased from the original application through a misunderstanding of the invention by the solicitors, *Held* that the Commissioner of Patents committed no error in granting a reissue containing a claim embracing such feature.

The fact that a reissue application was filed within two years after the grant of an original patent, while it may not be conclusive against the charge of unreasonable delay, is entitled to some consideration in view of that provision of the patent laws by which nothing less than two full years' public use of an invention is a bar to an application for a patent.

In determining whether an inventor is guilty of inexcusable delay, the fact that the correction of a mistake by reissue was before any adverse rights had accrued is a consideration of paramount importance, and it ought to count something in his favor that, being of foreign birth, education, and an alien tongue, he encountered difficulties in acquiring a knowledge of our language and laws.

There is no patentable combination in a mere aggregation of old devices which produce no new effect or result due to their concurrent or successive joint and co-operating action; but it is by no means essential to a patentable combination that the several devices or elements thereof should coact upon each other. It is sufficient if all the devices co-operate with respect to the work to be done and in furtherance thereof, although each device may perform its own particular function only.

If a patentee might have claimed an element generally and broadly, most assuredly his more limited claim cannot be successfully impeached.

It is settled that a disclaimer need not be filed until the court has passed upon the contested claims.

### United States Circuit Court.—Northern District of New York.

CRANDAL *et al. v.* THE PARKER CARRIAGE GOODS COMPANY.—PATENT LOOP FOR CARRIAGE TOP.

Coxe, J.:

A device which could not be used as a substitute for the patentee's invention without the exercise of invention is not an anticipation of it.

Where it can be seen that the patentee seeks by apt words of description to secure what he has honestly invented, and nothing more, the court should hesitate to regard with favor the accusation now so freely made against reissued patents.

### A Brief Sermon on Cranks.

The *Burlington Hawkeye* publishes a great deal of nonsense, but sometimes in its amusing way it states indisputable facts. The following is from a recent issue:

What would we do were it not for the cranks? How slowly the tired old world would move, did not the cranks keep it rushing along! Columbus was a crank on the subject of American discovery and circumnavigation, and at last he met the fate of most cranks, was thrown into prison, and died in poverty and disgrace. Greatly venerated now! Oh, yes, Telemachus, we usually esteem a crank most profoundly after we starve him to death. Harvey was a crank on the subject of the circulation of the blood; Galileo was an astronomical crank; Fulton was a crank on the subject of steam navigation; Morse was a telegraph crank. All the old abolitionists were cranks. The Pilgrim Fathers were cranks; John Bunyan was a crank; any man who doesn't think as you do, my son, is a crank. And by and by the crank you despise will have his name in every man's mouth, and a half completed monument to his memory crumbling down in a dozen cities, while nobody outside of your native village will know that you ever lived. Deal gently with the crank, my boy. Of course, some cranks are crankier than others, but do you be very slow to sneer at a man because he knows only one thing and you can't understand him. A crank, Telemachus, is a thing that turns something, it makes the wheels go round, it insures progress. True, it turns the same wheel all the time, and it can't do anything else, but that's what keeps the ship going ahead. The thing that goes in for variety, versatility, that changes its position a hundred times a day, that is no crank; that is the weather vane, my son. What? You nevertheless thank heaven you are not a crank? Don't do that, my son. May be you couldn't be a crank, if you would. Heaven is not very particular when it wants a weather vane; almost any man will do for that. But when it wants a crank, my boy, it looks about very carefully for the best man in the community. Before you thank heaven that you are not a crank, examine yourself carefully, and see what is the great deficiency that debars you from such an election.

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### Turning Bessemer Steel.

A job in a machine shop of Bessemer steel worked in the lathe with the ordinary turning tool would not come out right; the material appeared to lack tenacity; it crumbled when brought up by the turning tool to an edge. As an instance, some axles for cars on an elevated railroad were scored circumferentially. They were made of excellent Bessemer steel. The scores, somewhat more than a quarter of an inch deep, were turned in the usual way, but before the vees could be finished to a depth of about five-sixteenths of an inch, the metal crumbled at the top of the vee, and the entire job had a ragged look. It was found that the only way to do a good job on this material was to make a collection of toothed mills, and mill the scores instead of turning them. If the axles had been made of tenacious material like Norway or Low moor iron, there would have been no difficulty in cutting clean vee scores possessing all the toughness of the solid material.

### Safety of Railroad Traveling.

According to published statements, not a single individual riding on a passenger train in Massachusetts was killed the past year, unless the cause was directly traceable to the carelessness of the person killed. Over 61,000,000 passengers were carried, at an average distance of fifteen miles each. According to this statement, it is safer to be on a passenger train in Massachusetts than to be almost anywhere else. It is a remarkable fact that fewer accidents causing death occur on suburban tains, or those running through thickly settled districts, than in the open and sparsely settled country. The *Northwestern Lumberman* concludes that the reason for this is that more care is taken with such trains; that the shocking railroad accidents that are continually happening are the result of gross and criminal carelessness on the part of both managers and employes.

### ROCK CUTTING MACHINE.

The rock extracting industry seems to ever remain at the same point. Little progress has been made in the method of quarrying, and, nearly everywhere, use is still made of the wedge, the lever, and powder. Aside from the cost of the work and its defectiveness, there results considerable waste, while the blocks extracted are irregular in shape. We therefore believe it our duty to make known to our readers a new machine for cutting rocks, the invention of an engineer, Mr. Rapp.

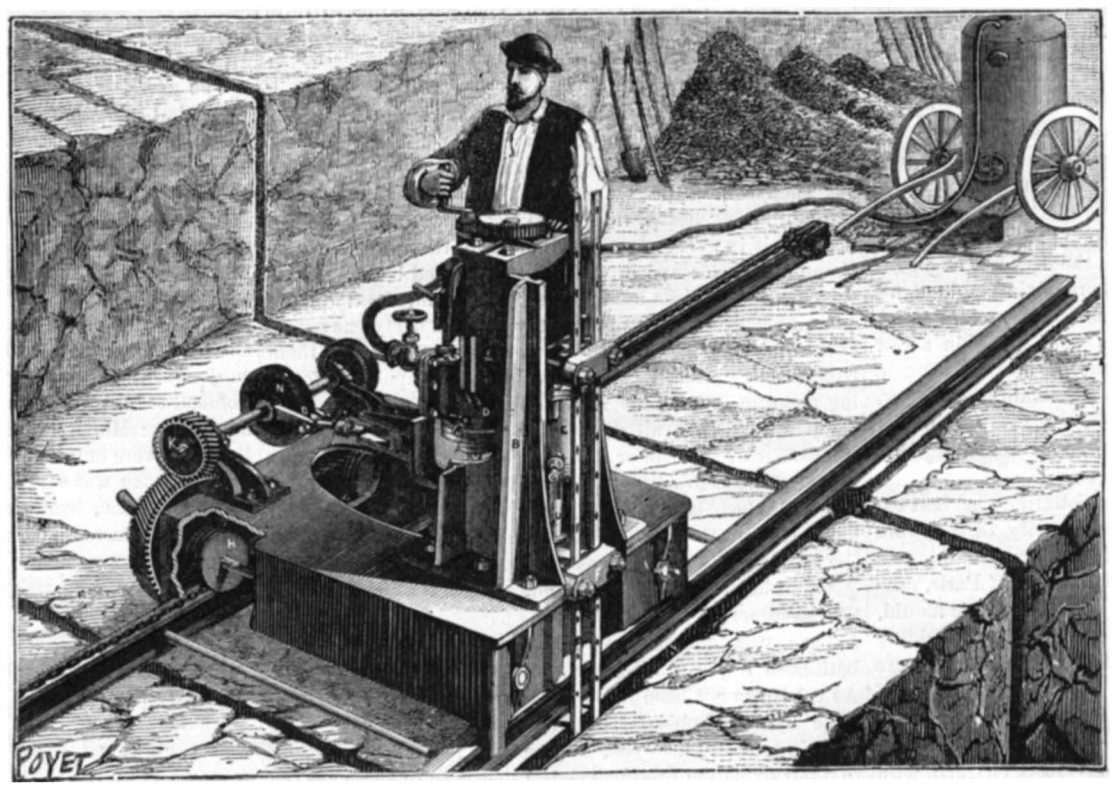
This machine, which is easy to maneuver and move about, appears to us to obviate all the inconveniences that we have just noted. It may be briefly described as follows: Upon a platform, A, are fixed two uprights, B, between which there are two cylinders, C and D, that are connected with a slide, against which the cutting tools, E, are fixed by means of pivoted supports, F. The steam, which is introduced through a pipe, R, is capable of giving the piston a velocity of 300 strokes per minute.

The steam cylinder, D, through a gearing formed of a wheel, S, and pinion, T, is capable of being moved vertically, thus permitting the cutting tools to work to a depth of 0·25 meter. In order to reach a greater depth, it is only necessary to unscrew the supports, F, and place the tool in the succeeding aperture.

The cylinder, C, contains air, which, through its sudden compression, forms a spring and prevents the machine from being damaged in cases where the cutting tools happen to meet with insufficient resistance. By means of an ingenious mechanism, each stroke of the piston gives the machine a to-and-fro motion, whose extent may be regulated by the operator according to the nature of the rock.

The total weight of the apparatus is 1,800 kilogrammes; the steam power required is that of from three to four horses, and the work effected per day varies between 6 square meters in marble and 20 in soft rock. One man and a boy assistant suffice to run it.

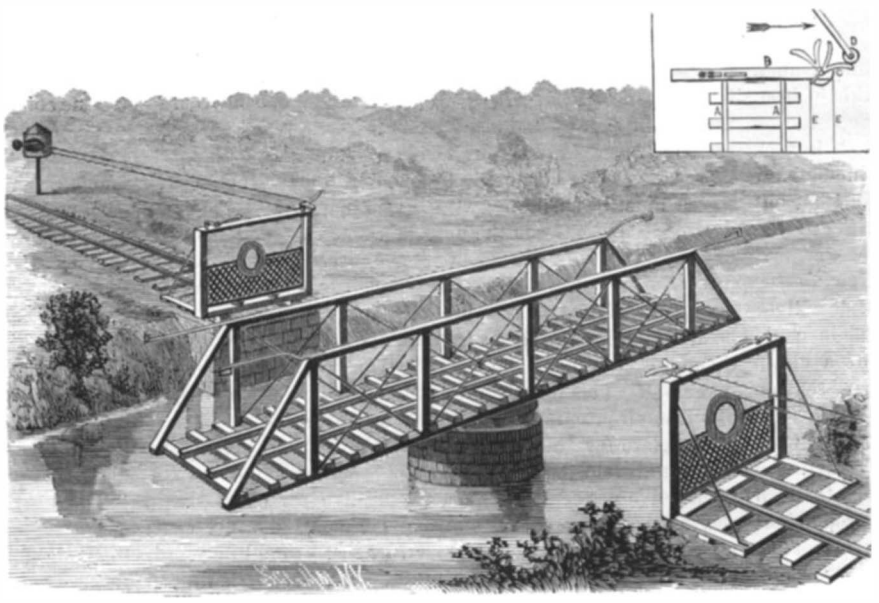
Mr. Rapp's rock cutter may be employed elsewhere than in quarries, and serves for all works of excavation, such as digging trenches, large canals, etc. For this latter purpose it offers the great advantages of permitting of the use of dynamite without any fear of lateral caving, since an absolute break will always be made between the bank and the cube to be taken out.—*La Nature.*




ROCK CUTTING MACHINE.

### DRAWBRIDGE SIGNAL.

The invention herewith illustrated relates to signals for drawbridges, and aims to prevent accidents either in railroads or common roads where the drawbridge is located, by indicating to approaching trains or vehicles whether the draw is open or closed, at such a distance from the bridge that the train or vehicle may be stopped in time, should the draw be open. This object is attained by a mechanism attached to the draw and the other standing parts of the bridge, and the action of which is sure and perfect. The bridge attendant has no control whatever over the attachments or signals, which are automatic in their action. The device is easy and simple to construct, and as castings are not essential an ordinary blacksmith could place one in position in a very short time. It would add but little to the weight of the bridge, and it could be attached to any drawbridge now built.



WILLIAMS' DRAWBRIDGE SIGNAL.

The distant signal is located from two to six hundred feet away from the bridge, where there is a small house for the signal, which is raised about ten feet from the ground. Wires are led from the bridge to this house, where they connect with the signal arm, upon which is a red ball about two feet in diameter; this constitutes the day signal, but at night the ball is removed and a red danger lamp hung in its place. The turning of the draw causes the signal to be swung out of the house at a right angle and within two feet of the passing train.

At the same time another signal, located at the end of the bridge or pier, is displayed. This consists of a gate built of light bar iron, and having a central opening about two feet in diameter faced around with a sheet iron collar, the whole being painted red. The night danger signal is hung from a hook in the central opening, and there is a tube or shield extending through the opening for the purpose of hiding the light from the engineer when the draw is closed. When the bridge has been swung open the gates are securely fastened, and so arranged that they cannot be unfastened, except by the turning back of the bridge to its original position, when the gates, being released, swing back where they properly belong. The distant signal may be dispensed with on bridges used entirely for vehicles.

Further information concerning this invention may be obtained from the patentee, Mr. James N. Williams, Scott Street, Mobile, Alabama.

### The Economy of Arc Lighting.

So much has been said by interested parties to make it appear that the arc light, as applied to street illumination, is expensive and even extravagant, that it is eminently desirable to get at figures which grow out of actual experience, and learn the lesson which they teach. Fortunately, just such figures are obtainable from the city of Hartford, in Connecticut, where the arc light has now been in use for some time, although on a limited scale up to the present time. It should be premised that the electric light was first introduced into Hartford about a year ago, and that it has stoutly held its own, notwithstanding the violent and almost virulent opposition of the gas company, which has done its best to bring it into disfavor and disrepute, and to oppose its introduction at every possible point. At last its turn seems to have come, for the authorities are loud in its favor, and in deciding to very materially increase the number of electric lights, report that each light in use actually displaces *six and one-half* street gas burners, giving, at the same time, at least *ten times as much light.* Now, each street gas lamp costs the city $35 per annum, the lamps burning 326 nights in the year. Six and one-half of these lamps, at $35 per year, cost the city $227.50 per annum. On the other hand, one electric light, which displaces these six and one-half gas lamps, costs the city 65 cents per night for 326 nights, or $211.90 per annum, a saving of $15.60 effected by each electric light per annum. Supposing Hartford to use one hundred arc lamps in its streets—and it is certain that the number in use will be increased to that figure within a very few months—the annual cash saving by displacing 650 gas lamps will be over $1,500, *besides the cost of lighting and extinguishing*, and the light furnished will not only be ten times as great in volume, but of a far better and pleasanter quality.

It will naturally be asked how it is that in Hartford one electric light displaces six and one-half gas-burners, while it was reported not long since that in Boston each arc light replaced but three and one-half gas burners. The answer is that in Boston many gas lights were kept burning so near the electric lights that their flames actually cast a shadow on the sidewalk, and that, in perhaps a majority of instances, the electric lights were not so placed as to render the greatest possible service. Whatever the cause may have been, it is very certain that certain influences were at work in Boston to throw disfavor on the electric light, and that it was not difficult for those in authority to so "cook" the returns as to make the worse appear the better cause.

But the reports that come from Hartford are those of persons who, at the outset, were bitterly opposed to the electric light, but who now, seeing its numerous advantages and fully convinced by their own experience of its superior economy, advocate its general introduction for street illumination.

For ourselves, we can say that we have never for a moment doubted the permanent use of the arc light for all purposes, including street lighting, where large spaces are to be illuminated. As we have already said, ten years hence we expect to see ten and perhaps twenty arc lights in use in this and every city where one now burns, and we expect to see such improvements as will render it cheaper, more simple, and far better than it is to-day. We are going to get far more electricity for the same expenditure of power, and far more power for the same expenditure of money. The incandescent light is invaluable in its place, but so, too, is the arc light in *its* place, and it has come to stay.—*Electrical Review.*

ARIZONA's total production of copper this year is expected to be nearly 50 per cent greater than last year's yield, which amounted to 17,000,000 pounds.

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### THE SUN LAMP APPLIED TO PHOTOGRAPHY.

Ever since lighting by means of electricity became practical, the idea has occurred to utilize it for photography. In fact, the new processes seemed to possess very great advantages over solar light, as the latter depends upon the state of the atmosphere, and is often insufficient in our latitude for full a third of the year.

The systems of lamps that were first used in the public streets, and which were consequently the best known, were the ones first employed, and for this reason it was the Jablochkoff candle that, in France, served to establish those photographic installations which were attempting to make progress in a new route. Every one will remember the little gallery which was conducted by Mr. Leibert in one of the salons on the first story at the Palace of Industry Here the apparatus which served to contain the electric light (which consisted of a Jablochkoff candle), and to project the same, were as yet very primitive and difficult to maneuver. The large parabolic copper reflector was designed for concentrating the luminous rays upon a limited surface, in order to give sufficient luminous intensity to the parts of the subject to be reproduced; so nothing but busts could be taken, and, moreover, the lights and shades were extremely pronounced, and the flesh, on account of the violet rays emitted by the lamp, exhibited livid reflections whose coloration and intensity varied according to the caprices of the unstable light.

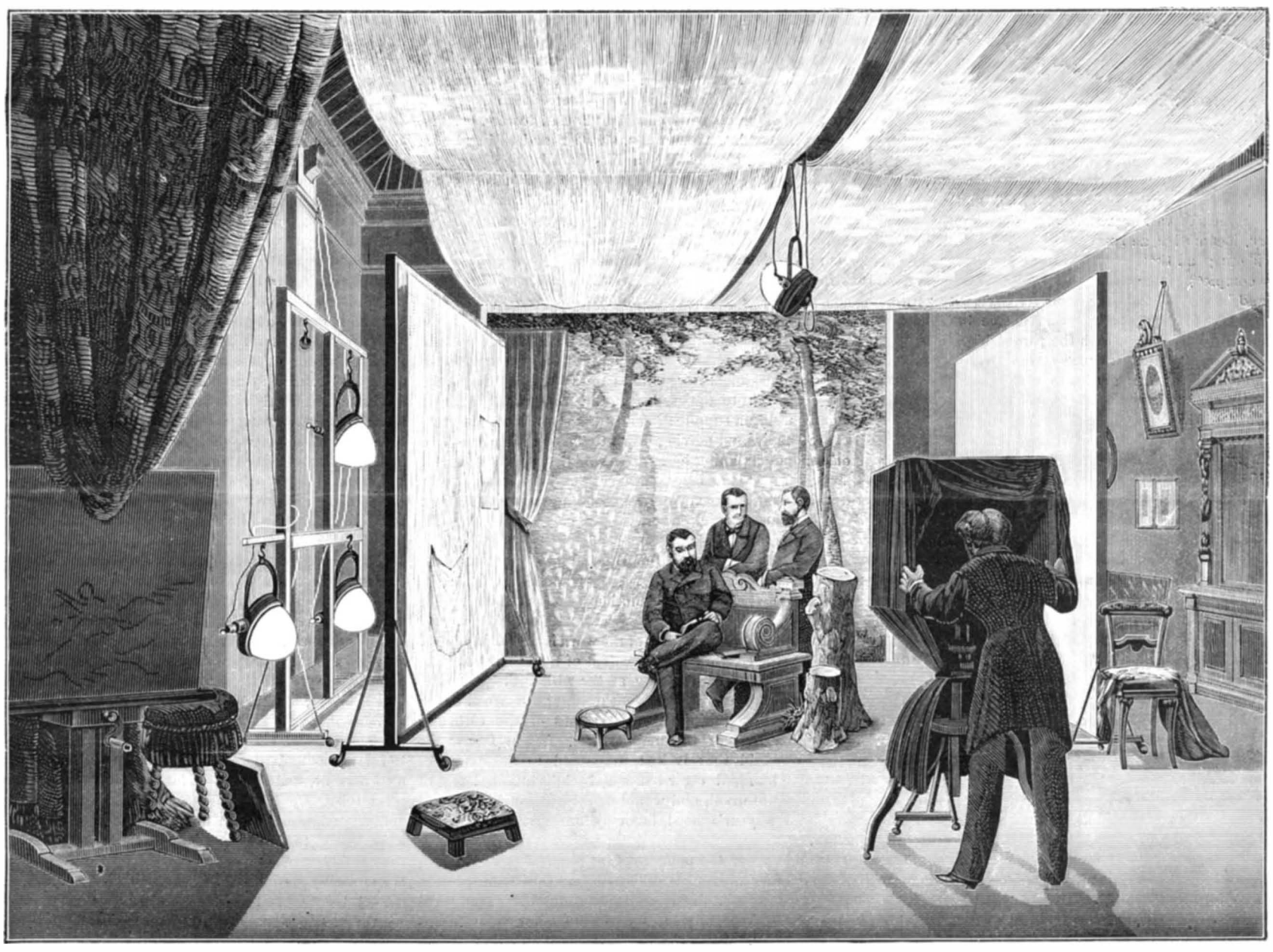
The sun lamp, which possesses all the qualities of coloration and steadiness of the incandescent light, and, at the same time, a luminous intensity as great as that given by the arc light, ought to be admirably adapted for photographic purposes. But, while waiting for carriages to a distance and distribution of electricity to enter the industrial domain (which it will ere long), the management of a truly practical gallery for utilizing Mr. Clerc's invention would have necessitated too great an expense, and it was a mere accident that permitted the installation to be arranged that we now have under consideration.

Alongside of the sun lamp works, in Wagram Avenue, is situated Mr. Boscher's photographic gallery, and it was therefore easy to arrange a few meters of cable to carry the current to lamps arranged for photographic operations. The steam engine is running all day long in the lamp works, and, in the evening, it is only necessary to notify the engine man to continue his work in order to have a beautiful light that permits of taking, just as in broad daylight, the most varied negatives.

The sun lamp is well known to the public, which has, at various times, had an opportunity of judging of its merits during the experiments at the Continental Hotel, on the Jouffroy road, in the picture gallery of the Exhibition of Electricity, and in the grand foyer of the Opera House. At present the lamp and machines are much superior to what they were at first, and it is indeed strange that this light has not found more applications in Paris, where it would give more satisfactory results than all those that are at present illuminating the great industrial and commercial centers and the theaters and other places of amusement.

We give, in the accompanying engraving, the details of an application of this lamp to photography in Mr. Boscher's gallery. There are four of the sun lamps, and they are arranged as follows: The first is suspended from the center of the posing room, beneath a white drapery. The illuminating surface, which is covered with a slightly ground globe, is directed toward the drapery, and the latter serves to reflect the light. The lamp, which is suspended from a longitudinal cable, may be slid along by means of a pulley, and be removed from or brought near the subject to be photographed, in such a way as to well light the upper part. Two like frames, which are mounted upon rollers, carry three other lamps (provided with opalescent globes), which may be placed laterally so as to send the light toward the center of the body and that portion of the floor upon which the feet of the subject or of the persons forming a group are resting. In order to prevent the rays from falling too directly (which would give glaring whites, and shades without transparency), a large white screen of a thin, white fabric, upon which rose or other colored gauzes may likewise be placed, is interposed between the lamps and the model. Another opaque screen is placed alongside of the objective during the operation, in order to prevent the luminous rays from striking the gelatino-bromide plate too directly.

All the walls of the apartment, moreover, are of a very light tint, and, through the arrangements that we have just indicated, there is obtained a diffused light, whose intensity may be very easily varied at any given point. The time of exposure necessary in order to obtain good results is scarcely longer than with daylight, and the proofs of album cards that we have examined in Wagram Avenue demonstrate that hereafter lovers of beautiful photographs will not have to be dependent upon the caprices of the light of the sun.—*La Lumiere Electrique.*



A PHOTOGRAPHIC GALLERY LIGHTED BY THE SUN LAMP.

### A Great Meteor.

Mr. L. C. Yale, of Norwood, St. Lawrence Co., N. Y,. writes to the *News* of that place describing a remarkable meteor which he saw there at 8:30 P. M., on July 3. It moved slowly from east to west, had a long tail, a nucleus like a globe, as large as the moon, surrounded by a bright ring, two dark lines crossing the nucleus in vertical direction, the lines larger in middle, straight on inside, curved on outside, tapering both ways to points. The tail was 30 degrees length. The general appearance was that of a gigantic sword of fire, moving handle first through space.

### Brazilian Diamond Mines.

The diamond beds of Bahia and Minas Geraes, in Brazil, are very similar in character as regards the minerals composing them and their plateau form, or situation on watercourses. A new bed has been recently opened on the Rio Pardo in Bahia, which presents some differences to those hitherto known in Brazil. The country around is low and marshy, and covered with forests. The working of these forests has led to the discovery of the diamonds, which are found in a white clay along with beds of decomposed leaves. The deposit appears of modern formation. The minerals of the clay accompanying the diamond are, according to M. Gorceux, quartz, silex, monazite, zircon, disthene, staurotede, grenat almandine, corindon, and some oxides of iron. There are no oxides of titanium, or tourmalines, as is frequently the case in diamond beds. The clay appears to be from its character and situation the debris of the granite mountains bordering on the Bahia coasts.

### Easy Method of Reducing Bromide of Silver Residues.

M. Scola communicates to the *Bulletin* of the French Photographic Society an easy method of reducing waste bromide of silver to the metallic state, and not only obtaining the bromide in a useful form, but also generating an electric current at the same time.

To separate the bromide of silver from the waste emulsion, M. Scola recommends that two or three per cent of sulphuric acid should be added, and the mixture should be boiled for some minutes, after which the bromide settles rapidly to the bottom of the vessel. It is now washed and dried, when it is ready to be cast into sticks for use in the battery about to be described.

The battery in which the reduction is effected is constructed on precisely the same principles as the chloride of silver battery of Warren de la Rue, and one form of this, as is well known, consists of a rod of amalgamated zinc immersed in acidulated water, and opposed to a similar rod of fused chloride of silver, a platinum wire being embedded in this latter to serve as a conducting terminal. When the plates of the battery are connected by a conducting circuit, the chloride of silver becomes reduced to the condition of metallic silver, while the chlorine unites with some of the zinc to form chloride of zinc.

If the negative plate of the battery is made of fused bromide of silver, reduction takes place quite readily when the terminals are united; and when the battery is exhausted it is merely necessary to fuse the resulting spongy silver in order to obtain it in a convenient condition for use in making a fresh supply of nitrate, while the whole of the bromine takes the form of bromide of zinc, and remains in solution.

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### A Genius of the Jack Knife.

BY DR. G. ARCHIE STOCKWELL.

Carving in wood is far from being a new or even recent art, though it has received vigorous impulse of late, owing to the "æsthetic craze" that replaces the stove with the open grate, and tabooes mantels of slate and marble, substituting instead the product of our native forests, handsomely or uglily graven as the case may be. Economy cannot be claimed therefor, since grotesque carvings, unheard of pillars and pilasters, hideous heads, meaningless emblems, and zoological distortions are made to meet the requirements of the longest purse; their only utility, so far as discovered, being counter-irritants to the placidity of the housewife, and traps for the reception of dust and dirt.

Wood carving, however, can be made both beautiful and ornamental; and I was recently delighted by an examination of a host of such, not one of which was from the hand of the professional artist, but the product of an illiterate cripple, whose only tool, aside from a carpenter's saw, is a single-bladed pocket knife.

"Whittling William," for such is the pseudonym bestowed upon him by his neighbors, was introduced to my notice while sojourning in the little village of Kirkwood, twelve miles out of St. Louis, Mo. The accounts I had previously received of the man, coupled with the exhibition of specimens of his work in the way of busts of Sir Walter Scott, Napoleon the Great, Lord Byron, etc., further whetted my curiosity, and accordingly I made it in my way to visit the little old church occupied by him as a workshop and domicile.

Here a perfect wilderness of oddities met my eye, the walls and shelves being covered with an incongruous assortment of curiosities, from chains, frames, statuettes, miniature copies of mechanics' tools, carved frames, brackets, boats, canoes, steam and sailing craft, architectural designs, flutes, toy houses and furniture, animals, birds, and a cuckoo clock, to models of various forms of machinery, including stationary, locomotive, and marine engines, looms, thrashing machines, etc.; and though all were in wood, they were apparently complete even to the most minute details. Even flowers and leaves were in some cases imitated with scrupulous fidelity, and after viewing a carved tree branch, with nest and eggs of a thrush, with the parent bird close by, I could readily believe that no undertaking was too difficult or too chimerical for this genius to undertake; though he subsequently acknowledged that "scroll work was long the great bother" of his life.

Rather prone to reticence, and withal somewhat shy and modest, it was with some difficulty that I succeeded in obtaining Mr. Yoe's history, which after all proved uneventful enough, even quite commonplace. Born in the city of St. Louis, he was early apprenticed to a millwright, from whom he ran away, forfeiting his indentures, while still in his teens. With the breaking out of the Civil War he entered the army, from which he was discharged after the lapse of eighteen months, having suffered amputation of his right foot as the sequel to a gunshot wound. Though always considered "handy" with the knife, it was not until his twenty-third year that he became fully aware of his peculiar talent, which was then brought out in the construction of a doll's house undertaken to please a younger sister. This excited so much praise and admiration that he at last conceived the project of turning it to profit, and accordingly adopted his present occupation, which, he assures me, is fairly remunerative.

His first essays were of rather a low order, consisting, for the most part, of walking sticks, chains, puzzles, and nondescripts put together in narrow neck bottles so as to fully occupy the interior—feats by no means uncommon among the rural youth of New England. Later, on viewing a so-called model of "Bingen Castle," he was seized with a desire to duplicate it, which he acomplished successfully, including its six hundred windows and doors and many odd shaped towers and turrets. For this piece of work he realized the munificent sum of $20.

His next feat was a model, four feet long, of the celebrated Bristol, of the Narragansett line of Sound steamers, his only guide being one of Endicott's colored lithographs; and in this he was so far successful as to find a purchaser as soon as completed in the person of a gentleman from Texas.

Other steamers and ships innumerable have since left his hands, wonderfully perfect and complete in detail, though he is devoid of all nautical knowledge save as gleaned from various models, drawings, engravings, and from the "Kedge Anchor; or, Young Sailor's Assistant." How his eye and hand so readily master secrets that frequently puzzle the initiated is a mystery, since he understands neither the principles of proportion or perspective, nor the art of delineation with pencil and pen!

Recently a miniature ocean steamship was constructed to order for parties residing in Great Britain, which on being fitted by the purchasers with miniature machinery in brass, including engines, boilers, and screw, is said to have developed a speed on her trial trip equivalent to sixteen miles per hour; this statement, however, may be taken with some allowance, since the craft was less than five feet in length over all, and the scene of her performance a pond scarce twenty rods in diameter. For this he received a trifle less than two hundred guineas.

Mr. Yoe boasts, in his modest way, of his ability to duplicate with his knife alone any piece of work undertaken by joiner, cabinetmaker, wheelwright, professional carver, or other worker in woods with a complete outfit of edged tools, if only allowed his own choice of material; also that the Patent Office at Washington contains more than three hundred models, the product of his skill in behalf of would-be patentees. He is ambitious also in certain ways; he desires to visit Europe to view and study certain celebrated and historical structures which he desires to imitate, such as Westminster Abbey, St. Paul's, St. Peter's, the Cathedral of Cologne, Tower of Pisa, Escurial at Madrid, and tomb of Napoleon. This seems to be about the sum and substance of his knowledge of architecture abroad; to found a museum of jackknifery, so to speak, in St. Louis or some other large city that will afford him encouragement, which will astonish the world; and finally to be considered and known as the "Champion Whittler of the World," and, if possible, meet some other would-be champion in contest of pine and shavings.

One of the designs now latent in his brain is a copy of each of the capitol buildings of the original thirteen States, artistically grouped around the National capitol. The State houses of Missouri and Texas have been imitated with flattering success, the former yet in Mr. Yoe's workshop awaiting a purchaser, while the latter has passed into the possession of a gentleman at Austin.

At this writing, he is engaged upon a momentous undertaking, which, if successful, he believes will be the masterpiece of his life—an automaton water and landscape of nearly 300,000 pieces and 1,100 movements, to be put in motion by means of an overshot wheel driven by a stream of sand falling from a hopper. This will occupy a space of forty-eight by sixteen feet, is already more than half completed, and embraces windmills, light houses, towers, bridges, railways and trains, canal boats, steamers and sailing crafts, hills, dwellings, etc., besides a Noah's ark, a copy of the Strassburg Cathedral and its wonderful clock, model of the New York, West Shore, and Buffalo Railway Depot at Buffalo, and a host of moving and performing figures.

Of these, a brig weighing less than half a pound and complete in all details, contains 1,800 distinct pieces; Noah's ark, forty inches long, 3,400 pieces; the depot, eleven by fourteen and nine feet high, is a wonderful piece of work, out of which trains will dart at intervals, the same movement putting in motion some ninety figures on the platform and in and about the building. Besides the ordinary features of the Strassbourg clock, the chimes in the spire, on striking, cause the Virgin to appear before the cross on the altar of the cathedral in a supplicating attitude; two hundred figures leave the choir, and moving down the main aisle pause for a moment contemplating her, and then disappear behind the altar piece. At stated periods, also, the inhabitants of the ark sally forth by a gangway, and defiling down the side of the hill, return by a circuitous route, entering in the same way at the opposite side. Canal boats pass up the river; vessels in harbor toss upon the water; figures in door yards pursue their usual vocations, while in one instance a man constantly saws wood, while another as monotonously plies the ax.

One of the peculiar features of the work is that each subject is complete in itself, and independent of the others—may be used separately or connectedly at the will of the operator. Again, aside from paint and cloth nothing but wood enters into the construction, saving the chimes of the cathedral and the iron shaft of the main wheel. When I saw the affair, I was told that it had proceeded to the extent of twenty-five hundred cigar boxes and eight hundred feet of pine and white wood, and would require as much more and more than a year's hard labor before arriving at completion.

It would appear too ponderous for removal or exhibition, but the builder asserts his ability to take down and pack in small compass suitable for transportation in less than three hours, and again to unpack and put together again in less than half a day. All in all it is a queer combination, and in spite of its incongruity and possible defects—for he is forced to draw upon his imagination for many of the details—it is a most interesting piece of mechanism.

That the man is a prodigy cannot be gainsaid, and he is far from being the egotistical character one would suppose, exeept in his desire to be considered a "champion" etc., but "champions" are all the rage now. He claims his gift as a natural, inborn one, as it doubtless is, and declares he is often lost in astonishment and wonder at the completeness and results of his labors, and the ease with which difficulties are surmounted when once fairly reached. All offers of instruction in drawing, mechanics, or mathematics he obstinately refuses, since he is just superstitious enough to believe they would tend to mar his genius, if not cause it to altogether desert him. Undoubtedly half way instruction would have some such effect by causing him to mistrust the ability of which he is now so confident.

After viewing the many evidences of Mr. Yoe's handiwork, I can readily conceive how many a boy may work out a future by the aid of a knife, provided he has patience, perseverance, aptitude, and endurance; it may lay the foundation of a career in mechanics or architecture, as a designer and inventor, or one of a host of other useful arts. I feel this the more in that, though moderately skillful with the pencil and to a degree familiar with the pen, I could never develop sufficient genius to mend my own quills or manufacture a respectable toothpick. Edison, who has gained some fame as an inventor, I knew well, even intimately, in his boyhood, and he was an unwearying, insatiable, devotee of the jack knife!

### Prevention of Yellow Fever Mortality by Vaccination.

Dr. Freire, of Rio Janeiro, in a recent letter to the *Sanitary News*, writes as follows:

In compliance with your request, I will give you an account of the chief points of interest connected with my studies on yellow fever. I can, of course, give you only a very brief summary, and for further information may refer you to my two memoirs—"The Cause, Nature, and Treatment of Yellow Fever" and "The Contagion of Yellow Fever." An extended report on all the theoretical and practical bearings of my researches is now in press, and a copy will be sent to you as soon as issued.

The method of culture which I have followed is Pasteur's. I withdraw blood, or any other organic liquid, from persons sick with yellow fever, or from the bodies of the dead, using the most scrupulous precautions, and introduce these liquids into Pasteur's flasks, previously sterilized, and containing a solution of gelatine or beef "bouillon." In these conditions the microbe develops abundantly, and becomes of itself attenuated by the action of the air, which filters through the tampion or amianthus with which the flask is corked. The purity of these cultures is demonstrated by microscopic examinations, of which you will find a good illustration in my memoir, "Experimental Studies on the Contagion of Yellow Fever."

The microbe appears in the form of little black points, like grains of sand (780 diameters); in the mature form it presents the appearance of round cells with an ash-gray or black rim, containing in their interior yellow and black pigment and some granulations which will be the future spores. These cells burst at a given moment, and pour out their contents, *i. e.*, the spores, the pigments, and a nitrogenous substance composed of ptomaines, which I have isolated not only from vomited matter, but also from the blood itself, and from the urine. The yellow pigment, being very soluble, produces the icteric infiltration of all the tissues by a sort of tinctorial imbibition which may go on even after death; the black pigment, as well as the detritus, resulting from the rupture of the cells, being insoluble, is carried into the general circulation, and produces obstructions in the sanguine capillaries, whence the apoplectic symptoms so common in yellow fever and in the urinary tubules, whence the suppression of the urine, a very frequent and terrible symptom in this disease.

I have described this microscopic organism under the name of *Cryptococcus xanthogenicus;* its development resembling that of this genus of algæ.

After having demonstrated the contagious nature of yellow fever by experiments upon barn-door fowls (see my memoir), I made experiments in preventive inoculations, first upon animals and afterward upon men; I did not fear to do this, because a multitude of experiments upon animals had previously convinced me of the perfect safety of inoculation with attenuated cultures.

Up to this date I have vaccinated 450 persons, for the most part foreigners recently arrived. Freedom from yellow fever has been pronounced among those thus vaccinated, for they have passed through a quite severe epidemic, and only six deaths have occurred among the 450 vaccinated persons, that is to say, less than two in a hundred, while more than a thousand deaths have occurred among the non-vaccinated, the mortality of the non-vaccinated sick being about thirty to forty per hundred. Thus, if we take one hundred vaccinated persons, under the most favorable conditions as regards receptivity, we have only two deaths during the entire epidemic; if we take one hundred non-vaccinated sick, we have thirty to forty decedents, which gives a mortality fifteen times greater among the non-vaccinated. Even if the mortality were only ten times or five times less great among the vaccinated, the preventive measure would be worthy of adoption. The protective inoculation for charbon gives an immunity to one-tenth, and that of vaccination for small-pox guarantees an immunity to one-fifth, according to the calculations of Bousquet.

DR. DOMINGOS FREIRE,
*Professor in the Faculty of Medicine of Rio Janeiro, President of the Central Junta of Public Hygiene.*

### A New System of Painting Iron.

A process, on a new principle, for protecting iron and steel from corrosion (especially when submerged) has been suggested by Mr. F. Maxwell-Lyte, F.C.S. The theory of the process is essentially electrical; and its utility is based upon the hypothesis that the oxidation of iron and steel is much accelerated by, if not wholly due to, galvanic action. The metal to be protected is first coated with one or two primings of an oxide of a metal electro-positive to iron, upon which any of the ordinary anti-fouling or oxide paints may be applied. These latter always contain the oxide of a metal electro-negative to iron; and this oxide will consequently always be reduced, and the iron oxidized in time. The priming employed by Mr. Maxwell-Lyte is composed of oxide of zinc or magnesia, particularly the latter; and this not only protects the iron, but keeps it from contact with the outer coat. It is claimed that something of this kind has always been used whenever painting of iron has been even partially successful; but that the guiding principle—the use in the first place of a material electro-positive to iron—has been overlooked. Red lead as a priming does fairly well for a time; because though lead is electro-negative to iron, it is only slightly so. Better protection is assured by the use of a distinctly basic material.

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## ENGINEERING INVENTIONS.

A gas engine has been patented by Mr. Johannes Spiel, of Berlin, Germany. It has two explosion chambers united by a tube, so that after the explosion in one chamber the burning gases will ignite the gases in the other cylinder or chamber automatically; a perforated metal ball is also arranged in the bottom of each cylinder, and connected with a water pipe for condensing water into these balls, which water is converted into steam to assist in driving the engine.

## MECHANICAL INVENTIONS.

A hinge mortise machine has been patented by Mr. Joseph D. Thurston, of South Union, Me. The angle plate has a slot and a bracket, and the sliding plate or tool carrier has a stem extending up through a guide socket of the bracket, the carrier also having perpendicular cutters, with other novel devices to facilitate the making of mortises to receive the plates of butt hinges.

A motor has been patented by Mr. George H. Furman, of New London, Huron County, O. An inner cylinder or drum, having pockets, is combined with an outer drum with pockets, the inner cylinder being attached to a shaft and formed with peripheral inclined pockets, in combination with the independently revolving surrounding cylinder or drum, weights in the pockets causing the shaft to revolve continuously.

## AGRICULTURAL INVENTIONS.

A cotton seed planter has been patented by Mr. Thomas P. Hopper, of Sherman, Texas. This invention covers several novel features of construction, whereby the seed may be fed from the hopper regularly and in uniform quantity, and will be separated before they are dropped to the ground.

A plowshare has been patented by Mr. James C. Pugh, of Ashton, Dakota Ter. The plate forming the cutting edge has its longitudinal center and landside edge thicker than its main part, the plate forming the cutting edge being adjustable, so it can be easily sharpened, and, owing to its shape, the original width of the cut can be maintained.

A plow attachment has been patented by Mr. Reuben Jones, of Hogansville, Ga. A guard is attached to the plow beam, suspended by links that are adjustable, so that the guard may be held in a higher or lower position, for the purpose of gauging the depth of furrow or quantity of soil thrown up around young plants.

A grain thrasher and separator has been patented by Messrs. Albert J. and Josiah H. Marshall, of Evansville, Wis. The straw carrier and separator is combined with carrier belts, rocking bars, beater fingers, springs for accelerating the closing action of the fingers, with other novel features, whereby the work is done quickly and thoroughly, without danger of the carrier being clogged by the straw.

A seed planter has been patented by Messrs. Louis Pietzsch, John J. Armstrong, and Joseph R. Lowrey, of Weimar, Texas. This invention covers improvements on a cotton seed planting machine formerly patented, whereby the dropping apparatus may be arranged for corn and or other seeds, and so the machine may be used to better advantage for cultivating the ground.

A potato digger has been patented by Mr. Reuben R. James, of Rising Sun, Ind. This invention relates to plows for turning potatoes out of the ground, curved bars or fingers being substituted for the mould board for raking out the potatoes, and to turn away weeds, vines, etc., while there is an attachment for raking the soil and laying bare any potatoes that may be covered, with other novel features.

## MISCELLANEOUS INVENTIONS.

A derrick has been patented by Mr. Cornele G. Ross, of Rutland, Vt. The invention covers a novel combination of worm and friction gearing, whereby the mast and boom of a derrick can be readily turned either to the right or left, at the same time a load is being raised or lowered.

A pool and billiard cue chalker has been patented by Mr. Emil T. Mueller, of La Crosse, Wis. It is an improved device for holding a piece of chalk for chalking billiard cues, and is adapted to be secured to the side or any other convenient part of the billiard or pool table.

A horse training apparatus has been patented by Mr. Robert R. Parshall, of Westfield, Pa. The invention covers an attachment for harness, consisting of straps, loops, and side pieces, designed more especially to prevent trotting horses from breaking when driven at high speed.

A washing machine has been patented by Mr. Richard E. Harper, of Butler, Mo. In this invention the construction is such that the tub is rotated only when the pounder is lifted out of contact with the clothes, in order not to tear them, and the construction makes a simple and easily operated device.

A bran duster has been patented by Mr. Joseph W. Wilson, of Brookville, Kansas. Revolving brushes, operating in connection with a fan, rub the annular stream of bran passing through the machine against the cloth of a bolt, and there are several other new features and novel combinations.

A neck wear fastener has been patented by Mr. Joseph H. Wright, of New York city. The invention covers a spring wire frame with two upwardly projecting prongs bent downwardly from their upper parts, and then bent laterally in opposite directions, making a fastener which can be easily secured on the shield or detached therefrom.

A dumping scow has been patented by Mr. Franklin P. Eastman, of New York city. The hinged or pivoted wings are so connected to the side walls of the well of the scow that the angle of inclination may be varied, and its capacity increased or decreased according to the nature of the contents with which it is desired to load the scow.

A process and composition for tanning and dressing old leather and leather articles has been patented by Mr. Edwin W. Hewitt, of Louisville, Ky. A solution is used of sumac, American water pepper, dog fennel, lye, and carbonate of soda, made and used in a specified way, and the leather is afterward dried, oiled, and finished.

A combined knife and fork has been patented by Mr. Albert H. Forsyth, of Worcester, Mass. This invention covers novel means for fastening the knife and fork to their handles, the blade of the knife and the prongs of the fork being passed into recesses in the handles so they can be readily carried, and there being no rivets visible, as they are within the handle.

A hand bag has been patented by Mr. Robert Weintraud, of Offenbach-on-the-Main, Germany. The invention provides a device for holding a purse, pocketbook, or like article, so that they can be easily taken from the bag for use, and cannot become detached and get mingled with other articles when the bag is closed.

A hydraulic jack has been patented by Mr. Thomas A. Watson, of Brooklyn, N. Y. The invention covers improvement in the pump cylinder, so the backflow passages for the liquid are removed from the face against which the plunger or piston acts, with improved arrangements for the valves of the ram and the pump plunger, with other novel devices.

A trunk has been patented by Messrs. John T. Dupont and William J. Cooke, of New York city. By this invention the front wall of the trunk is removable, and trays are arranged to slide horizontally in the trunk, and with this advantage is secured other novel features of construction; besides, the trunk is strong and durable, and easy to open and close.

A stem holding device for watches has been patented by Mr. George T. Banghman, of Bellefontaine, O. The invention consists mainly of a collet or ring within the pendant, through which the stem having an inner shoulder is permitted to turn freely, the collet having one or more screws or pins arranged to enter the hole or holes in the pendant in which the ends of the bows fit.

A detachable book cover has been patented by Mr. James Gordon, of Stratford, Ontario, Canada. Combined with the covers of the holder is a binder formed of two relatively fixed plates between which a strip is clamped, and by which the binder is fastened to the covers, and a pivoted, movable clamping plate, to bind the book or articles to be held firmly but removably to the covers.

An educational device has been patented by Mr. Hugh V. Dunn, of Scott's Depot, West Va. On a frame is arranged a series of standards, operated by levers and finger board, by which can be displayed to a class of children the alphabet and various words, or the multiplication table and simple problems, so the attention of the children will be easily secured and their lessons quickly learned.

A permutation lock has been patented by Mr. Charles Tregoning, of Lead City, Dakota Ter. The invention provides means whereby two disks may be operated by one visible dial, and means whereby a series of dials may all be liberated at once to be set relatively to each other, the arrangement of two disks to be registered by one dial preventing any one seeing the combination while the lock is unlocked.

An electric temperature regulator has been patented by Mr. Charles A. Tucker, of Islip, N. Y. A window frame with slats is so connected with a pivoted lever carrying an armature, an electro magnet, and battery, and the mercury tube of a thermometer, that the window slats will be opened when the temperature rises to a certain point, and closed as the temperature falls.

A fence has been patented by Mr. John D. Davis, of Wilmington, Del. It is a durable and ornamental fence for grounds, verandas, etc., made mostly of merchant iron, not altered in shape except by perforations, forming four tenons to a panel, and flattening the pickets to shape the heads, the ornaments being cast in form to apply to the fence without machine work, and no screws or bolts being used.

A fireplace stove has been patented by Mr. James D. Richards, of Patriot, Ind. The roof of the stove is formed of a curved plate loosely supported on walls, the plate being adapted to slide forward and backward, and by proper adjustment the draught may be made to pass up in front of the plate or behind it, with other novel features to economize hot air and save fuel, as well as to facilitate thorough ventilation.

An apparatus for cooking or steaming fruits, vegetables, etc., has been patented by Mr. James L. Smith, of Milford, Del. There is an elevated cooking or steaming vessel, the cover of the furnace having inwardly projecting flanges, on which the coil is supported in a horizontal position, and pipes connecting the ends of the coil with the steaming vessel, with other novel features.

A hose coupling has been patented by Messrs. Robert A. Brauer and Thomas Roche, of Oshkosh, Wis. It is formed of a female and male part of which the former has a spring hook with a staple, and the male part has a notch with a hook adapted to pass into the staple; there are also beveled projections on the hose coupling sections to protect the locking devices.

Improved shelving forms the subject of a patent issued to Mr. John Zerr, of Keokuk, Iowa. Legs having apertured cross bars have shelves held thereon by screws passed through the ends of the shelves into the cross bars, the shelves preferably having angle plates secured on their ends, and being also supported by intermediate legs between the legs supporting the ends of the shelves.

A window shade bracket has been patented by Mr. John F. Miller, of Newton, Kansas. Combined with a bracket arm is a slide, and another slide held on the outer end of the first one, at right angles to it, the transverse side having an arm for holding one end of the roller, constituting a device by which any roller can be used on any window, the roller projecting more or less over the side of the window casing.

A sacking, weighing, and registering machine has been patented by Mr. George H. Caughrean, of Raymore, Mo. It is a combination machine with a vibrating frame having platforms and sack holders, connecting rods, levers, and a slotted scale bar with adjustable slots and a traveling weight, whereby the weight of the filled sacks will reverse the cut-off, taking the product as it comes from thrashing machines, corn shellers, etc.

A button hole cutting attachment for button hole stitching machines has been patented by Mr. Arthur Felber, of Brooklyn, N. Y. The invention consists principally in applying a narrow blade to the needle bar for cutting the button hole through the material, the blade being arranged in line with the needle and adapted to be held out of contact with the goods except when making the edge stitch in stitching the first side of the button hole.

A cartridge loading machine has been patented by Mr. Bryant W. Annin, of Hannibal, Mo. The invention covers a holding disk with apertures to hold the cartridge shells in upright position, an adjustable loading gauge with receptacles for ammunition, a movable canister adapted to fit upon the gauge, a ramming device, with various other novel features, whereby a large number of shells can be loaded simultaneously and expeditiously.

A fisherman's minnow bucket has been patented by Mr. George W. Barton, of Bethlehem, Ky. A central guide rod is secured to the bottom of the bucket, and a false bottom is adapted to slide on this rod, and with a handle having spring catches engaging with the guide rod, so the minnows in the bucket may all be raised to the surface of the water and caught in the hand without rolling up the sleeves and feeling in the water for them.

Metal roofing forms the subject of a patent issued to Mr. John H. Dellmon, of Pine Bluff, Ark. This is a novel construction of sheet metal roofing, the strips or sheets of metal being turned and bent on their opposite side edges, so that when fitted to each other and supported they will expand and contract without breaking the metal, there will be no leakage at the seams, and the roofing will lie close to the sheathing on which it rests.

An automatic power windlass has been patented by Mr. Reuben G. Cheney, of Atchison, Kan. This invention relates to windlasses where a shaft and clutch are constantly revolved in one direction, a spool being fitted loosely on the shaft, to engage the clutch at the will of the operator, and by this improvement the spool is engaged with the clutch by a positive motion that will not cause too sudden a shock in starting and to disengage it at the proper time, adjusting the device when thus disengaged.

## NEW BOOKS AND PUBLICATIONS.

MINE VENTILATION. By Eugene B. Wilson. John Wiley & Sons, New York.

The author treats concisely of the practical as well as the theoretical in mine ventilation, with perhaps rather more use of figures than most miners will appreciate, although the book is stated to be rather for the use of miners than for engineers.

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## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Name and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.

**Special Information** requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Minerals** sent for examination should be distinctly marked or labeled.

(1) N. S. C. asks a recipe for making a waterproof blacking which will give a fine polish without rubbing, and will not injure the leather. A. A well known waterproof blacking has the following composition:

| | |
|---|---|
| Beeswax | 18 parts. |
| Spermaceti | 6 " |
| Oil of turpentine | 66 " |
| Asphalt varnish | 5 " |
| Powdered borax | 1 " |
| Vine twig black | 5 " |
| Prussian blue | 2 " |
| Nitro benzol | 1 part. |

Melt the wax, add powdered borax, and stir till a kind of jelly has formed. In another pan melt spermaceti, add the asphalt varnish, previously mixed with oil of turpentine; stir well and add to the wax. Lastly add the color previously rubbed smooth with a little of the mass. Perfume with nitrobenzol. 2. Also a good black varnish which will dry instantaneously. A. A good varnish is prepared by mixing a filtered solution of 80 parts of shellac in 15 parts of alcohol with 3 parts of wax, 2 parts of castor oil, and a sufficient quantity of pigment. The mixture is evaporated in a vacuum to a sirup. The varnish is applied to the leather with a brush moistened with alcohol or with a colorless alcoholic varnish.

(2) H. K. asks how to make a black hectograph ink. A. Dissolve one part nigrosine in about five parts water and one of alcohol, and add one part of glycerine. It is impossible to obtain as satisfactory an impression or as large a number of copies with the black ink as with the purple colored one.

(3) D. D. S. wants a process for making iron castings malleable. A. Iron castings cannot be made malleable. The making of malleable iron castings is a special process, in which the carbon is nearly burned out before the metal is poured.

(4) F. H. W. asks what he can put on sheet brass with a brush that will protect it from nitric acid. A. Melted paraffine.

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(5) G. G. P. asks: How are carpet tacks made? Are they struck cold or hot? A. Tacks are made on machines that cut the tack blank off the end of a strip of sheet iron, cold, the width of the strip representing the length necessary for the finished tack. The same machine upsets and forms the head, and for carpet tacks the material is worked cold.

(6) J. P. D.—I wish to plane off a pair of cast iron clamps used for bending sheet iron, but they are too hard; how can I soften them? A. Heat them bright red, sprinkle powdered borax on them, and cool them in ashes. Why not grind them instead of planing them?

(7) T. P. H. asks the length of the Cincinnati suspension bridge. A. The totallength, including approaches, is 2,252 feet; there is a single span of 1,057 feet from center to center of towers, and two half spans of 281 feet each.

(8) B. K. asks: 1. Can terra cotta be made from common clay? A. Yes, but it must be free from pebbles and other particles. 2. Can you tell me the name of a book that treats fully on the manufacture of terra cotta and pressed brick, also ordinary brick? A. Davis on Bricks, Tiles, and Terra Cotta, published by Henry Carey Baird & Co., Philadelphia. 3. In what State are the best pressed brick made? A. Pennsylvania. 4. Does not the smooth surface of pressed brick impair its adhesive quality somewhat? A. Yes. 5. Are the brick made the same size in all States? A. There is a slight difference in the sizes. Maine brick average 7·5x3 375x2·375 in.; North River brick, 8x3·5x 2·25 in.; Philadelphia front, 8.25x4·125x2 375 in.; varying somewhat among different manufacturers and for different degrees of intensity in their burning. 6. What is the crushing resistance of pressed and ordinary brick? A. Crushing weight per square inch: Common brick 800 to 4,000 pounds. Hard pressed brick, 2,000 to 4,300 pounds.

(9) H. H. W. asks how to use silver solder. A. Melt silver solder with blow pipe, or in fire the same as brass. Use borax for flux.

(10) F. A. T. Z. says: I would like to know how to melt and run aluminum into a bar. I tried with different kinds of flux, but it seems to burn away instead of melting into a button. Is there any alloy which I could mix with aluminum, in order to produce the so-called aluminum gold? In one of your papers, I see recommended a mixture of ten parts of aluminum with ninety parts of copper; would this metal tarnish when exposed to the air? I am a metal beater by trade; have tried several compositions, but they all seem to tarnish when exposed any length of time. A. To melt alumina, use a black lead crucible. Drive the alumina foil into an iron cone much the same shape as the bottom of the crucible, place the alumina in the crucible, and cover with crude soda and charcoal pulverized together. Heat slowly. To make aluminum gold or bronze, melt 90 parts copper, with soda and borax for a flux, then add ten parts aluminum (all by weight) a little at a time by putting small pieces in a split stick of hard wood and pushing down to the bottom of the crucible. This mixture is of the color of gold, tough and malleable, and does not tarnish.

(11) W. B. R. says: When in Florida last winter, I put up by canning process some lemon juice in Mason jars with Boyd's caps, and shipped same. The acid ate the caps entirely through in many places, and most of the jars were empty. I mention this that others may not meet with same loss. Is metal that lemon juice will corrode so rapidly suitable for canning currants, strawberries, pie plant, etc.? Is the lemon juice left in the jars fit for food, or does it probably hold in solution the metal of the caps to such an amount as to be poisonous? A. The citric acid of the lemon juice absorbs tin, lead, and zinc, or any of their compounds. The specimen cover appears to be an alloy of tin and zinc. It is unfit for jar covers for any fruits containing citric acid. Jars are now made with glass tops which should be used for these fruits.

(12) D. G. asks whether there is anything with which to cut sand paper. A. Cut it with a knife upon the back lightly, and pull apart.

(13) W. A. L. asks as to the best material for the floor of a roller skating rink. A. A roller skating rink should be no more nor less than a good ball room for the size of your town, something that you can use for all purposes. Narrow maple makes a good floor. When used for skating, a little powdered resin, sprinkled upon the floor and swept evenly with a broom, no more used than will prevent slipping, will make this the acme of a skating rink.

(14) J. W. M. asks the proper distance for grate bars from boilers 14 feet long, boiler 42 inches diameter. Smoke stack 33 inches diameter, 52 feet long; bridge wall 7 inches from boilers. A. 24 inches for anthracite coal, 30 to 36 inches for bituminous coal.

(15) R. N. C. asks: Will you please inform me which is the longest and the largest artificial bridge in the world? Also how many crusades were there? A. Parkersburg, W. Va., is said to have the longest bridge in the world, its length being 2,147 meters; but we should style the New York and Brooklyn bridge the largest bridge as it is the greatest and has the longest single span.—There were five crusades in which Jerusalem was the objective point, besides one by Saint Louis against Egypt in 1248.

(16) J. K. asks: 1. Is the pressure greater on a slide valve in the shape commonly adopted by engine builders than it would be on a straight or plain piece, same size each way as the valve where it rests on seat? A. Never greater than its area multiplied by the pressure, but less by the back pressure due to cutting off and the slight pressure from the exhaust. 2. Is there more piston pressure and area on a corrugated piston head than on a plain one? A. There is more surface, but not more pressure. 3. To keep melted cast iron hot in a ladle, we drop in a small chunk of lead, and apparently it boils. What is it that produces the effect? Does the lead burn? A. The lead caused boiling from the evaporation of a small portion of lead at high temperature of melted iron, or possibly the alloy suddenly formed with the iron liberated part of the carbon of the iron as a gas.

(17) P. B. A. says: I am about to make a sectional boiler of mercury flasks, as described in SUPPLEMENT No. 182. Will you give me a little further information on the subject. 1. Are all mercury flasks the same size (*i. e.*, about 4½x12 inch), or are there larger sizes? A. All mercury flasks are about the same size. 2. Will a boiler made of 9 flasks below (for water) and 2 above (to hold steam and draw from) be large enough to supply my engine—3 inch bore, 4 inch stroke? Shall feed with "Korting" inspirator. Can I not feed as slowly as the water evaporates? These flasks are so very thick and small in proportion that, allowing for the inferiority of the iron (which is not charcoal hammered), they should stand a pressure of 300 pounds and not burst. I shall set the safety valve at 80 pounds, and run with between 60 and 80 pounds, which ought to be perfectly safe, if one flask does not rob another. In your issue of May 24, in answer to W. H. P., you condemn twin boilers with one common connection; so do I, but how else can I unite my flasks? The center one will of course get the most heat, being directly over center of fire; will it expel its water into the outside row of flasks? A. A boiler made of 9 mercury flasks will not be large enough for your 3x4 cylinder with any development of power. Feeding only as you make steam, or the jet system, has not been a success, although often tried. There is no trouble about the strength of a flask boiler. The trouble will be to control the generation of steam without a reservoir of water in the boiler. If you make all of the connections large, and carry the water as marked on your sketch, and keep an even fire, you will not have much difficulty in making all the steam the surface will be capable of, but the surface of the water being small makes it liable to foam up into the steam chamber.

(18) T. R. S. says: I am trying to make a little model cylinder 2 by 4 inches; how large a boiler would it take to drive it? What would you make the pattern out of? Do you think lead would do to make it? This will be the first time I have tried to make one, so please excuse me asking these simple questions. A. About 6 square feet of fire surface; make your pattern of pine.

(19) Waho asks if there is anything that will act as an absorbent of nicotine? A. Anything in which nicotine is soluble will absorb it, such as water, alcohol, ether, and fat oils.

(20) C. D. P.—Your modes of propulsion are both inferior to simple oars, and will not give so good result for the power applied.

(21) F. V. R. asks: What is the explosive named panclastite made of? A. Carbon disulphide and hyponitric acid.

(22) A. H. L. says: I have been using purified animal charcoal, asbestos, and sand in a filter, and although these materials have all been purified (the sand and asbestos by heat), the water after a few days comes through sometimes with a putrid taste and odor and sometimes with a flavor of slate. The only other materials with which the water comes in contact are zinc, brass, glass, and tin. How can I purify the filtering media so as to avoid giving the water any taste at all? A. The essential function of most filters is to separate mechanical impurities; these readily contaminate the absorbents. They should therefore be frequently replaced, and probably therein lies your difficulty.

(23) R. R. McQ. asks: Have you any other method of preserving eggs than the Havana process that is reliable beyond a doubt? A. Several processes for the preservation of eggs are given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.

(24) P. O. W. asks: 1. What is used to cement the top part of lamps on to the glass? A. Use either plaster of Paris or else a mixture of one part caustic soda and three parts of colophony with five parts of water, and knead up the resin soap thus formed with half its weight of gypsum. 2. Can you tell me how to make an ink to trace on paper with, so that when it is placed face downward on cloth and a warm iron passed over it, it will leave the pattern on the cloth? A. Such inks consist of the ordinary solution of coloring matter mixed with sufficient resin to make it quite thick; after drying on the original, the cloth is placed over, and by heating the resin is dissolved and will impart its coloring matter to the cloth. White lead is used for producing a white color, Prussian blue or ultramarine for blue, and so on.

(25) H. D. V. V. desires to be informed how to test lard oil, so as to show whether it is pure or not. A. Chemical analysis is the only means of positively determining its purity. The following factors may serve to guide you in regard to its condition. Its gravity should be about 0·915, its flashing point about 525° Fah., and fire test about 600° Fah.

(26) A. M. T. asks the title and publisher of a good work on preserving and canning fish, vegetables, etc. A. There is no book published on this subject. Each packer has little secrets of his own, but the process is practically identical throughout, and has not changed since its inception. See Hints on Preserving and Canning, SCIENTIFIC AMERICAN SUPPLEMENT, No. 305.

(27) W. E. writes: The fumes or smell of sulphur coming from vineyards where flowers of sulphur have been used to prevent mildew on the grape so thoroughly pervades the atmosphere in that vicinity, especially after nightfall, as to be a source of much annoyance within doors in all cases where the vines so treated are located to the windward. It is desirable to avoid the very unpleasant odor if possible. The constant subjection to it for five or six months of the summer and fall season calls for a relief. Can you inform me of some means, whereby the odor can be neutralized on the inside of residences, so as to be less disagreeable? A. There must be some mistake here, as no amount of sulphur scattered on vines or on the ground would produce any unpleasant odor. Even in greenhouses where the vines are washed with a solution of sulphur, and each vine coated with the mixture and thus blown about the house in dust, it is almost impossible to detect any smell of sulphur. If the sulphur is burned, then of course its odor would be very perceptible, but to deodorize the smoke or fumes would of course take the sulphurous acids all out of the vapors, and so entirely do away with any beneficial effects designed to destroy insect or fungus life. The burning of pastilles or some strong perfume might answer for closed rooms, but at best it could not entirely destroy the odor.

(28) J. A. D. asks: 1. Will concrete stand frost? Will it disintegrate by dampness or moisture? A. Concrete will stand frost if kept dry, but will disintegrate from the surface if frozen wet. It does not disintegrate by moisture alone. Much depends upon the quality of the cement used. The best Portland is very hard—strong—and resists disintegrating influences longest. 2. Can water be charged with carbonic acid gas? If so, with what per cent? A. Water absorbs its own bulk of carbonic acid gas at ordinary temperature and pressure. At high pressures it absorbs many times its bulk.

(29) C. C. writes: Would you not be kind enough to let me know, namely: 1. What coffee dust is used for? A. It is sold either as an inferior grade of coffee, or else mixed with chiccory and sold. It could be employed to manufacture the extract of coffee. 2. Who are the manufacturers of axle grease for machinery, made with blacklead, besides Dixon's? A. There are none.

(30) W. A. W. asks: How can I make rubber hold quicksilver and yet retain its pliancy? A. Good pure gum rubber, as sold by the manufacturers, if not overstretched will hold mercury and also retain its pliancy. 2. What expansion does a board undergo lengthwise? A. Substantially none.

(31) A. F. B. asks the shape and size of the flasks and clamps that rubber stamp makers use. A. Flasks like those used by brass foundry men, but made very small, will answer your purpose. You can vulcanize small jobs in a dentist's vulcanizer. 2. What pressure of steam would 320° on Hayes mercury bath thermometer indicate? A. 320° indicates 100 pounds pressure to the square inch.

(32) A. R. K. asks: Can a storage battery be made to light a four candle power incandescent lamp? A. Four cells of plunging bichromate battery will operate a four candle power incandescent lamp. If you require a constant battery, use four cells of Bunsen bichromate.

(33) W. F. S. asks: 1. Please inform me which are the best works for studying electrical engineering. I have a fair knowledge of the rudiments of the subject. A. Begin with Ganot's Physics; then study Gordon's Magnetism and Electricity; Dirge's Electric Illumination; Electricity, its sources and Applications, by John T. Sprague; Gordon on Electric Lighting; and procure a copy of Henry and Jamieson's Pocket-book of Electrical Rules and Tables. 2. Please say if electrical engineering offers better inducements as a profession than civil engineering? A. We should say neither better nor worse; all depends on industry and natural ability. 3. Also, do you think that wood engraving (as a trade) is less remunerative than heretofore? A. The pay of first class wood engravers is not less than it has been.

(34) J. S. P. asks if there is a simple work on electricity suitable for a boy 14 years old, who wishes to study it up during his holidays. A. Ganot's Physics and Electricity, its Sources and Applications, by John T. Sprague, will probably meet your want.

(35) F. B. D. says: I made a small induction coil, according to instructions given in SCIENTIFIC AMERICAN, about two years ago. It is very strong, and is satisfactory in every way as far as power goes, but the current is very uneven, and if you are holding the handles you will get severe shocks. I would like to know what is wrong? A. The difficulty with your induction coil is probably due to imperfection in the contact surfaces of your interrupter.

(36) J. F. D. asks: Why cannot an arc lamp be inclosed in a vacuum? And if it could, would there not be a great saving effected? A. It is not common to inclose an arc lamp in a vacuum; it might effect a saving, were it not for the wasting away of the electrodes and the difficulty of maintaining a vacuum.

(37) R. T. W. asks how to prepare tallow so as to use it as a lubricant. A. Tallow may be made soft with any oil, such as lard or kerosene. Kerosene and tallow make a very cheap lubricant.

(38) C. E. A. says: Our house was blown over the other day, and some claim that it was because a window was open on the side toward the wind. I think that it doesn't make much difference whether the window was open or not. How is it? A. The open window probably did have a slight effect.

(39) W. G. S. asks a recipe for a varnish, paint, or other coating that could be applied to iron scale beams, that are used in damp cellars in which large quantities of salt are used in curing hides. A. A coat of boiled linseed oil rubbed over the scales and allowed to dry is a good preservative. As the oil gets rubbed off by use of scales, rub the parts again with the oil upon a cloth. You cannot keep the scales bright and clean and prevent rust.

(40) C. P. F. asks: 1. If it will be wise to run his water pipe to a greater height than the roof, thereby securing water in case of fire on the roof. A. It would most certainly be wise to carry the water pipes above the roof. 2. How he can connect the pipe so as to insure an electrical contact between the joints? A. Screwing the pipes together strongly with plumbago and oil will give a sufficient metallic contact for all electrical purposes.

(41) C. O. N. asks the process by which buckram is made. Such as is used by carriage and sleigh manufacturers. A. Buckram is woven in a loom; it is linen, stiffened by glue starch. You may buy the coarse linen cloth, and stiffen it with glue size. It should be stretched when sized.

(42) J. M.—We fear that you will not be able to fill your barometer perfectly. It is quite a delicate operation. The tube should be inverted, the leather cushion taken off, and the cistern filled with mercury. The tube is then heated to near the boiling point of mercury to drive out the air, or a vacuum produced upon the cistern, which will draw the air out from the tube, which will then become perfectly filled with the mercury, when the leather can be put on and the barometer turned to its proper position. There are instrument makers in your city that can do this kind of work.—Your hoisting engine and boiler is about 10 horse power. Use 6 to 8 cubic feet of water, and from 40 to 60 pounds of coal, according to speed per hour.

(43) J. E. B.—You will find articles upon lens grinding in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 318, 139; on Achromatism, No. 409; on Eyepieces; No. 399; on Telescopes, No. 252 and No. 1. We think that you could not obtain any information in regard to telescope making from the American Academy of Science.

(44) A. O. L. asks: Is there an apparatus in use anywhere, by which oil is utilized for fuel under boilers? A. Yes. See SUPPLEMENT No. 63 for petroleum furnace for locomotive boiler.

(45) T. D. S. asks: Would it be advisable for me to put in asphalt for flooring, in a roller skating rink? Would there be friction enough to keep wheels from slipping? A. Asphalt and sand well rammed and smoothed makes a fair roller skate floor, but is liable to become soft enough to crease in hot weather. The sand is necessary to harden the asphalt, but it is also liable to cut the rollers away fast. There is nothing so good as hard pine with a little powdered resin rubbed over the surface.

(46) D. S. M. Co. desire us to inform them of a preparation that will remove stains from black walnut, the stains being those made by liquor, etc. A. We know of nothing better to recommend than alcohol; oxalic acid and water are sometimes used to remove stains from mahogany furniture.

(47) A. H. asks: Can you inform me how I can mix alcohol with common turpentine? I wish to make the varnish for musical instruments that you recommended in SCIENTIFIC AMERICAN, but find upon trial that turpentine and alcohol will not unite. A. By heating to a low temperature the solution will probably take place. The following may perhaps be more suited for your purpose. Rectified spirits of wine, half gallon; add six ounces gum sandarac, three ounces gum mastic, and half pint turpentine varnish; put the foregoing in a tin can by the stove, frequently shaking till well dissolved; strain, and keep for use. If it is too hard, it may be thinned by adding turpentine varnish.

(48) C. R. asks: Is there any use for worn out porcelain bricks? Can they be reworked? A. We know of no use to which the bricks can be applied to. They cannot be reworked.

(49) J. H. S. writes: I wish to make a small furnace for melting gold, using a blast of hydrogen gas. Can I make and store the gas, with safety, in an apparatus like that used by dentists for making laughing gas, that is to generate the gas in a glass jar and conduct it into a reservoir, made of an inverted zinc barrel within another larger barrel half filled with water? And is there any advantage or additional safety in purifying the gas through water, before storing it? A. For your purpose the employment of ordinary illuminating gas will give results equally as satisfactory as any use of hydrogen will. Your methods are perfectly feasible if you desire to follow them.

(50) J. F. B. asks: Will you please tell me the name of the article that is being used by the manufacturers of rubber goods in place of Indiarubber? A. We know of nothing that is used by manufacturers of rubber goods to substitute rubber. Chicle and also balata has been suggested for this purpose. They are gums or exudations from tropical trees, but we are not disposed to believe that they are in practical employment. Their use has simply been suggested on account of their properties identical and similar to the pure rubber. Se articles on "The India Rubber and Gutta Percha Industries," SCIENTIFIC AMERICAN SUPPLEMENT, 249, 251, and 252.

(51) J. C. says: I want information how to construct an electric machine or galvanic battery to be mounted on a stand with handles, for persons to take hold, and a lever that will put on an increased force, with a dial attached which will show what each person can bear? A. The electric machine you refer to is simply a large induction coil provided with a movable core or a metal cover connected by a cord with the spindle of the index, which is supposed to indicate the strength of the current. When the core is pushed into the coil, it increases the strength of the secondary current, and permits the index to be moved by a spring which turns it in opposition to the cord. There is no real connection between the index and dial, and the coil. See SCIENTIFIC AMERICAN SUPPLEMENT 160.

(52) E. E. K. asks: 1. For a rule for finding the horse power of an engine when it is running? A. You can do this by means of a dynamometer and indicator; for full instructions consult works on this subject; also see SCIENTIFIC AMERICAN SUPPLEMENT. 2. Is there any use for old carbon points, such as used for electric lights? A. We think not. 3. How are lithographic pictures produced? A. Lithographic pictures are drawn upon a species of limestone, with lithographic crayons or pens. The stone carrying the drawing is wet, ink is then applied by means of a roller. The wet parts of the stone will repel the ink, while the ink attaches itself to the marks made by the lithographic crayon pen. A paper applied to the stone under pressure will receive an impression of the drawing made on the stone. 4. How large a boiler would it take to run an engine 1 x 2? A. About 8 inches in diameter and 18 inches high, with 20 ¾ inch flues. 5. Where could I get such such a one? What would it cost? A. Any coppersmith could make such a boiler. It would probably cost $15 to $20.

(53) J. S. C. asks: 1. What is the cause of the buzzing and snapping noises heard at times in the

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telephone? A. The buzzing is due to earth currents if the line is isolated from other lines, but if it is in close proximity to telegraph, telephone, or electric light wires, the buzzing is due to induction. 2. Would the fact that branches of trees rest against the wires have anything to do with it? A. If your line is charged by a battery, the grounding of the line against wet trees might create a buzzing. 3. What is the best book to give one a knowledge of the practical working of telephones, and what is its cost? A. Prescott's "Telephone, Electric Light, and other Novelties" and Du Moncel on the "Telephone" are probably the best works; they cost from $2.50 to $3 each.

(54) H. R.—Spelter in trade is zinc. The name has been used as a local term for a mixture of zinc and copper (granulated) used for brazing. Tubes are brazed by first turning and wiring the clean edges together. Then place pulverized borax and low melting brass granulated or in strips upon the inside, and turn the seam side down over a charcoal fire, commencing to melt at one end of the tube, and draw it slowly through the fire. Observe upon the inside of the tube the progress and condition of the brazing. The brazing material should always have more zinc in it than the tube that is to be brazed.

(55) J. J. H. asks: 1. How to keep windows from freezing? A. The most satisfactory method is by lowering the window from the top, thereby allowing ventilation and circulation of the air. The application of glycerine will prevent freezing. 2. A recipe for making cement for billiard cue tips. A. Try strong glue 50 parts, dissolved with a little turpentine in a sufficiency of water; to this mixture add a thick paste made with 100 parts of starch. It is applied cold. 3. And a cure for warts. A. A popular and useful remedy for warts consists of ivy leaves dried and ground to fine powder. The part having been moistened with strong vinegar, a pinch of the powder is sprinkled on it and then bound on with a strip of rag. A mixture of equal parts of savine and verdigris is also said to make an efficacious wart powder.

(56) J. E. R. desires a formula for silvering solution. A. Prepare a solution of 1 part potassium cyanide in 6 parts water; add it to a concentrated aqueous solution of nitrate of silver (free from acid), until the precipitate is redissolved. Mix this solution with fine chalk and apply after previous cleaning of the object.

(57) S. P. B. asks: 1. If the current in the field coils of a dynamo machine is an induced current? A. The current in the field magnet of a dynamo is either taken directly from the armature through the magnet coils, or the magnet is placed in a shunt circuit. 2. Are both field coils in the same circuit? A. Yes. 3. As the armature revolves, is there any reversal of the current? A. There are two classes of dynamo and magneto electric machines. One class delivers a direct current, the other alternating currents.

(58) H. H. E. asks: How the Edgerton system of making gas (as used in New Orleans) differs from the usual plan? A. The Edgerton system is the making of a permanent gas from crude petroleum by means of retorts. It is not new, except in some of the minor details, from other petroleum gas works.

(59) H. S. writes: I am experimenting with a new gas which I produce without fire. I employ copper vessels for the production of this gas. I have reason to think that a portion of the copper is taken up and becomes a part of the gas. If so, I wish to cleanse, or in other words, remove the copper from it. 1. Can you tell me how I can detect the presence of copper in the gas? A. The presence of copper may be detected by the green color with which the gas burns. By passing the gas through sulphureted hydrogen, a black precipitate will be obtained, or by running it through ammonia water a blue coloration will ensue, when copper is present. 2. And if present, how can I collect and remove it? I have thought that I could by pressure pass the gas through a chemical compound which has a strong affinity for copper, and so remove it. A. We should think that by passing the gas through sulphureted hydrogen and subsequent washing with water all copper would be removed.

(60) F. J. K. writes: You would oblige me by answering the following question, which is in dispute. Is the following size a 90 horse boiler or not: 70 tubes, 3 in.; 15½ ft. long, 60 in. diameter, with a water front supposed to be 2 horse, and a globe dome 24 x 24 of cast iron? There are many opinions on the capacity, and all agree except the maker of the boiler, who maintains 90; the others 63 to 65 at outside. Your opinion is very valuable to me in this. A. We calculate the horse power as follows: The area of one tube will be 1753·00, that is, 3·1416 × 3 = 9·4248; this multiplied by 12 gives us the 113·0976, which is the area of one foot. They are 15½ ft. in length, hence 113·0976 × 15½ = 1753·01, for 70 tubes = 122,710. This in sq. ft. is equivalent to 852·14. Hence for the tubes we have 852·14 sq. ft. The boiler shell is 5 ft. in diameter; 3·1416 × 5 = 15·7080 × 15½ = 243·25, divided by ½ = 121·63 ft., as the area of the shell. For the end we have as its diameter 5 ft. × 5 = 25 × 0·7854 (¼ of 3·1416) = 19·635 as the area of end ft. The sum of these is:

852·14
121·63
19·63
———
993·40

This divided by 12 or 14, according as you accept either number of square feet as being equivalent to the heating surface for each horse power, gives either 82·78 or 70·9 as the horse power of the boiler.

(61) W. H. W. says: I am greatly troubled with hornets, who have located in my top loft. They have built their nests in said loft, and multiplied frightfully this last season. Can you tell me the best and most effectual way of destroying these pests? They instantly charge any female who dares to enter said lofts. The intruders feel happy if they make good their retreat without being stung? A. There should be no trouble in getting rid of the hornets if attended to early in the season, when they commence to build their nests. Some pyrethrum powder and a good force pump (*e. g.*, Whitman's fountain pump), will do the work effectively. The powder to be stirred up in water (at the rate of ¼ pound to about 8 gallons of water), and the liquid to be sprayed on the nest. This should be done late in the evening or very early in the morning, when the hornets are all in the nest. Diluted kerosene emulsion may be substituted for the pyrethrum water. Later in the season, when the hornets are more numerous their destruction is of course more difficult.

(62) R. C.—The boiler you describe is in very common use and works well; large numbers have been used in steam launches and yachts, but for burning straw or wood as fuel it does not give sufficient furnace or firebox capacity, hence for this kind of fuel the locomotive boiler is better, as any desired capacity of furnace can be obtained. Either kind of boiler should have not less than 200 square feet heating surface, and if the return tubular is used 220 feet, would be better. We would not advise you to use a smaller cylinder than 8 inches diameter and 12 inches stroke. The engine will be more firm and steady if attached to the side of the boiler. There is no work published especially on portable engines, but Rigg on the Steam Engine (price about $15.00) will give you useful information. The automatic cut-off would not be worth while on such an engine. For an 8 inch cylinder by 12 inch stroke the steam ports should be 6 by ¾ inches, and exhaust ports 6 by 1½ inches.

(63) M. L. S. desires us to explain: 1. Upon what law of science, in Tufts' automatic fountains, a stream of water is made to rise from six to twelve inches above its own level? A. We believe the action of the automatic fountain is due to the elasticity of the air. The water flowing into the lower globe or reservoir expels the air, which is forced into the upper apartment; the air thus compressed acts upon the water and makes it jet out. By reference to any text book on physics, the full description will be found under the title of Hero's fountain. 2. Do you know of any reliable cure for catarrh? A. For the catarrh avoid the use of patent medicines, and consult a competent physician.

(64) J. W. H. asks a receipt for preparing water color white. A. It consists of zinc oxide mixed with water and a little glue or sizing of some sort. A beautiful and permanent white that can be used either in oil or water consists of powdered Roman alum 2 lb., honey 1 lb.; mix dry, powder, calcine in a shallow dish to whiteness, cool, wash, and dry. Then mix it with water and suitable sizing.

(65) S. T. H. asks the best method of dissolving odds and ends of sheet India rubber so as to utilize same. A. The best solvent for rubber is a mixture of methylated ether and petroleum spirit—the common benzolene used in sponge lamps. The general method, however, of using old India rubber is by heating it with steam, whereupon the sulphur discharges, the rubber melts, runs into hot water, and collects at the bottom of the pit, while the vapor prevents its burning.

(66) A. V. Co. ask: Can superheated steam be used in pipes or coils, to boil linseed oil in large iron kettles? What temperature can be secured by steam used in this way? Is any peculiar style of boiler required? A. Superheated steam can be used for boiling linseed oil, but is not considered economical, as the oil boils at 640°, which is a very high temperature for the economical use of steam. A kettle bricked up in a hot chamber, out of the direct contact with the fire, with a safety chimney, is much used.

(67) J. N. H.—1. Steam ports ⅞ x 7½ inches, exhaust 2 x 7½ inches. 2. Pipe not less than 2¾ inches diameter. 3. Your keys, if of ivory, should be bleached.

(68) W. H. P. says: I am tempering saws in lead, but find the cast iron kettle in which I hold it is so porous and burns away so quick that it makes it expensive. Can you tell me anything better than cast iron for that purpose? It would have to be large enough to hold about three tons of lead, which is brought to a bright red heat. A. If you have your lead pots cast *bottom down*, or in the same position that you use them, they will not be porous. Also make the bottom much thicker than the sides. Wrought iron is also used for lead pots. They are more expensive to make. Think that you will overcome much of your trouble by casting *right side up*.

(69) J. H. C. says: 1. I have two steel boilers 14 feet by 55 inches connected together on top of steam drums, with 4½ inch pipe; have the usual number of 3 inch flues. No connections at bottom; 4½ inch pipe to engine 30 feet off. Engine cylinder 16 x 42 inches, 50 revolutions per minute, eighty pounds steam. The water in the outside boiler continually ebbs up and down from 1 inch to 8 inches; what can be the cause, and what would remedy the trouble? A. The outside boiler evidently foams. It is doing more than its share of the work. There may be in the arrangement of the chimney connections a stronger draught upon the foaming boiler than upon the other one. The steam connections may also be unequal, or so as to favor the delivery of steam from the foaming boiler. Unequal firing will also produce the same effect. 2. How much water will flow through a pipe per minute, 1,400 feet long with a fall of 75 feet, first 100 feet of pipe 6 inches in diameter, next 400 feet 4 inches in diameter, the remainder 3 inches with ten elbows? A. You will obtain a flow of 18 to 20 cubic feet per minute. 3. How much pressure would be at lower end if shut up tight? A. A pressure due to its height, or 32½ lb. per square inch when closed. 4. Where can books and papers be had to gain a practical knowledge of the Brush and other electric lights? A. There are about 20 numbers of the SCIENTIFIC AMERICAN SUPPLEMENT that describe the various kinds of lights and systems. 5. Which is considered the best electric light now in the market for factories, mills, and cities? A. There are about as many different opinions as there are companies.

(70) W. B. W. writes: In a recent number of the SCIENTIFIC AMERICAN SUPPLEMENT (No. 160), directions were given for construc ing an induction coil which by using two pounds of No. 36 wire would give a half inch spark. Should like to know how much No. 31 silk covered wire I should have to use to obtain the same result? A. The coil described in the SUPPLEMENT yields a 1½ inch spark. The amount of fine wire given for the coil referred to is somewhat in excess of the requirements, and it is probable that if you use the same amount and make your bobbin somewhat longer (say 1¼) you will secure the same results. You do not state whether the size given is by American or English wire gauge. This would make some difference, as the English wire of this number is about the same as No. 32 American.

(71) W. K. R. asks for a good receipt for making blacking with bone black as a basis?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| A. Bone black | 47·00 | 49·74 | 42·40 | 36·00 |
| Molasses | 23·50 | 37·29 | 21·20 | 30 40 |
| Sulphuric acid | 7·55 | as $So_3$ | 10·64 | 1·53 |
| Vinegar | 7·00 | 9·32 | ... | ... |
| Hydrochloric acid | .... | ... | 5·32 | 2·00 |
| Gum arabic | 0·05 | 0·75 | .... | 1·00 |
| Olive oil | 5·00 | .... | .... | 5·00 |
| Sperm oil | .... | 0·55 | .... | .... |
| Whale oil | .... | .... | 3·00 | .... |
| Water | 8·50 | .... | 17·00 | 24·00 |
| Copperas | 0·70 | .... | ... | .... |

The first is the analysis of English, the second and third of American, and the fourth of French blacking.

(72) S. L. H. says: I am in quest of some substance that will remove clinkers from fire brick furnaces. Would not a furnace lined with soap stone be anti-clinker? A. Soap stone is the proper material for preventing clinker in furnaces. The mines are in New Hampshire.

(73) S. S. B.—The encyclopedia referred to does say that "Pitch of a roof is the ratio between the height and the space covered," and no more. Other authorities say it is the *ratio of the angle of the rafters*. This harmonizes for both double and single roofs.

(74) J. N. R. asks us a series of questions about the advisibility of adopting one or another system of water works for Lawrence, Kansas. We receive many such queries, which should properly be sent to an engineer, for they are of comparatively small public interest, almost always involve many questions not stated at the outset, and require an amount of personal attention and examination which we can hardly be asked to give gratuitously. To J. N. R. we would say that in order to decide what plan of water works are best suited for your city, we shall have to put ourselves in the place of a hydraulic engineer, and ask a great many questions, such as every particular in relation to the nature of the water in the Kansas River, and the eccentricities of the river. How much of the year it is clear? When not clear, is it loaded with sand or mud? In its muddy or high water stage is the water fit for household purposes? Is there any facility for low level reservoir of large capacity for supply during freshets? What is the average height of building—what, highest buildings? All of these points go to make up an opinion as to the best plan. The Holly system is the cheapest, but must have a supply uniform in quality which we fear in your case requires a settling reservoir. It will be unsafe to depend upon hydrants alone for fire purposes, 1,000 feet of hose is not admissible for fire purposes under this system. If with the combined system of Holly and high reservoir you are liable, without a low settling reservoir, to fill the whole system of pipe work with muddy water during flood season, this would have to be flushed out from the high reservoir to make the water fit for domestic use. Upon the whole, we think that the safest plan for a growing city as yours seems to be is to make plans in view of future wants, and start a plant for a uniform supply in quality of water from a low level reservoir large enough to supply clear water at all times, relying upon the Holly pressure system for all purposes, and in the near future build a storage reservoir that shall make a combined system perfect. You mention filtration. This is good to a limited extent, but has proved a failure for sudden demands. The system was built for the city of Newark, N. J. The supply being far short of the anticipation, the system was abandoned.

(75) W. L. S. asks: 1. How can I make a simple galvanometer? How can I find the focus of different forms of lenses? A. In SCIENTIFIC AMERICAN SUPPLEMENT No. 371 you will find a simple galvanometer described and illustrated. Find the focus of convex lenses by focalizing the image of the sun or any distant light upon a card or screen, and measure the distance from the lens to the image. For a concave lens make a circle of twice the diameter of the lens upon a card or screen, and project the image of the sun or a distant light upon the screen at a distance that the shadow of the edge of the lens will correspond with the circle; this distance will be its focal length. 2. How can I make a very black drawing ink, to use in the blue process of copying tracings? Have tried India ink rubbed in a solution of shellac and borax, but it is not satisfactory. A. We know of nothing blacker or better than India ink rubbed up with water only, as thick as it will flow.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. S. Co.—The specimen is ferruginous clay or clay colored red by being mixed with iron oxide. Fine qualities of it are used for red pigments.

## INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted**

**July 15, 1884,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Abrading points for dental and other uses, manufacture of, J. A. Swasey ... 301,936
Aerated and mineral waters, apparatus for the manufacture of, J. S. Pearson ... 301,919
Air and other gas, apparatus for cooling and impregnating, J. A. Saladin ... 302,163
Air and water forcing and exhausting machine, A. D. Shelnutt ... 302,167
Air compressor, H. Krutzsch ... 302,206
Alarm. See Burglar alarm.
Arbor, expansion. A. E. Lytle ... 301,905
Axle box, J. Dakers ... 301,867
Axle, car, J. L. Fleming ... 302,120
Axle, cap for carriage, J. M. Schorb, Jr ... 302,038
Bag. See Hand bag. Mail bag.
Bag holder, T. O'Niel ... 301,916
Bag holder, C. M. Ruland ... 302,162
Bale tie, W. Burtis ... 301,958
Bale tie, J. W. Griswold ... 302,202
Bale tie, Lenox & Hentz ... 302,009
Baling presses, alarm attachment for, J. L. Hall ... 301,883
Ball trap, J. S. Briggs ... 302,094
Ball trap, P. Marqua ... 301,908
Barn, portable, Keys & Slaughter ... 302,000
Barometer, J. Y. McCleary ... 301,910
Barrels of fractional parts of barrels, repairing or forming fibrous pulp, M. L. Deering ... 302,193
Bells, hanging, G. Campbell ... 301,856
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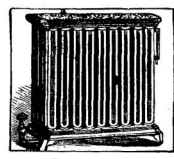
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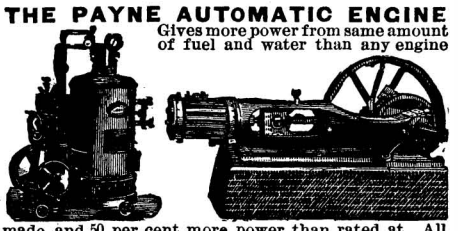

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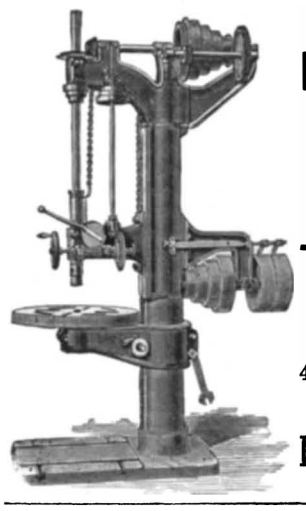

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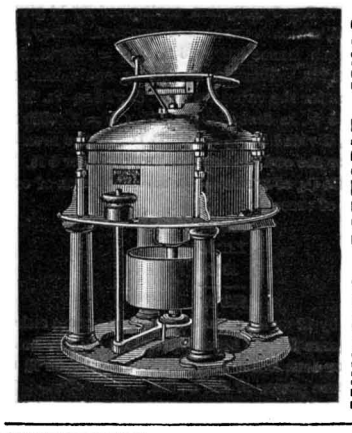

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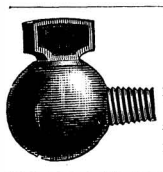

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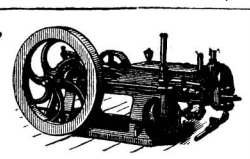

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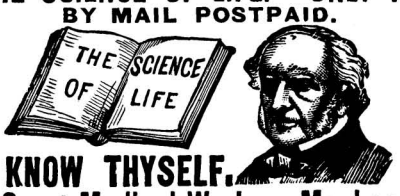


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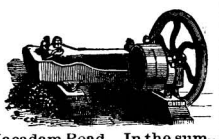

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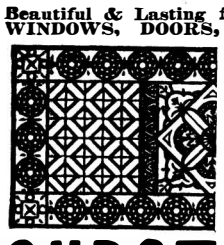

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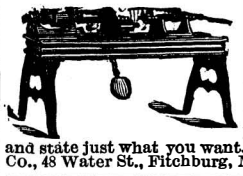

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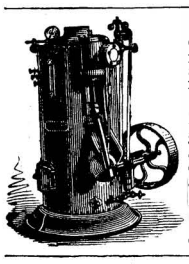

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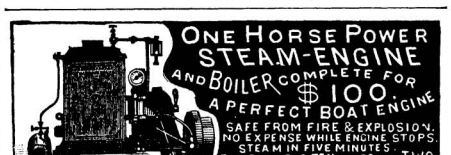
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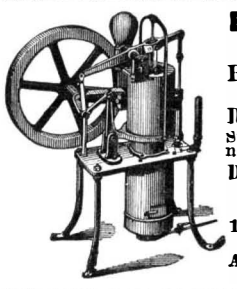

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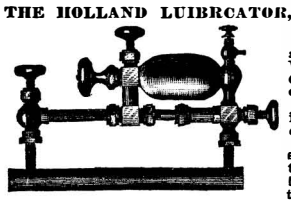

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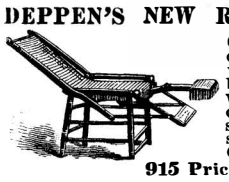

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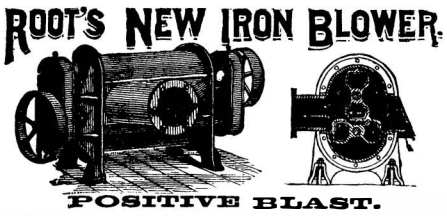

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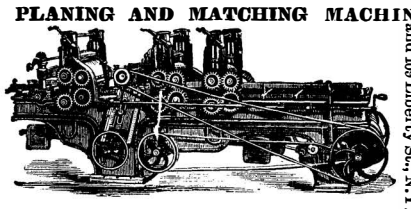

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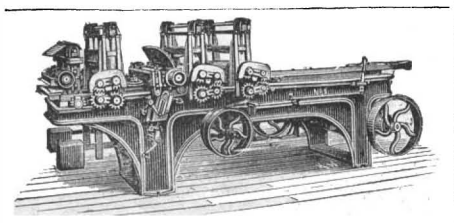

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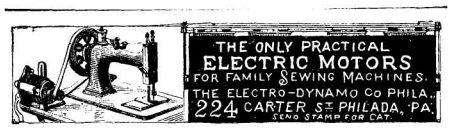


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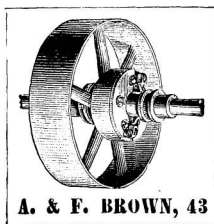

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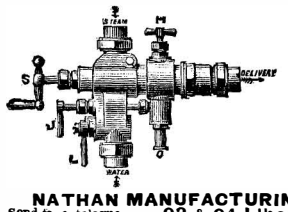

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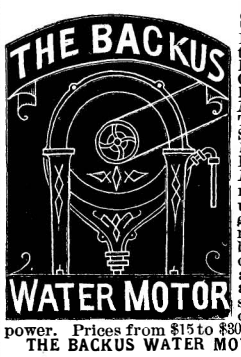


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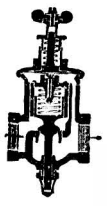

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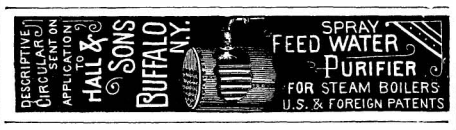


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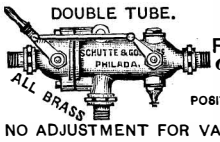


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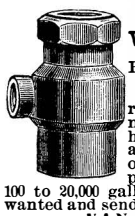

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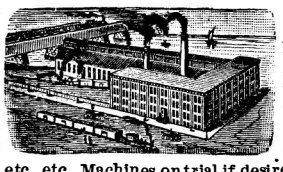

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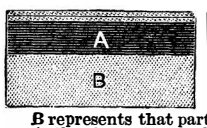


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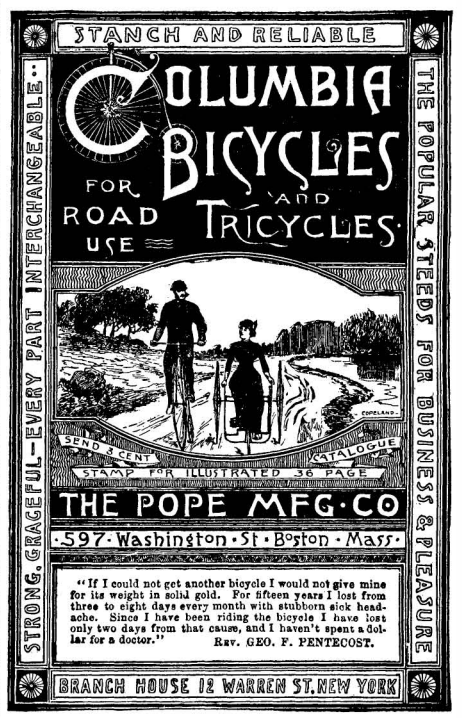
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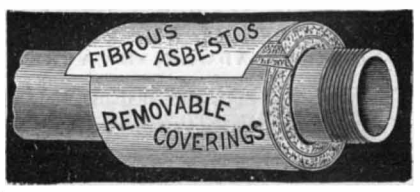


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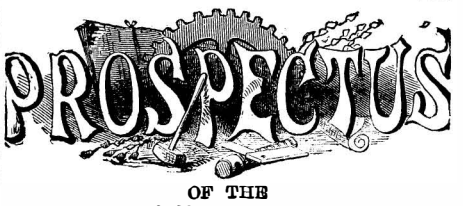


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